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POLLUTION OF THE INTERSTATE WATERS OF THE CORNEY DRAINAGE SYSTEM (ARKANSAS-LOUISIANA). PROCEEDINGS OF PUBLIC HEARING HELD AT HOMER, LOUISIANA, ON JANUARY 16-17, 1957. VOLUME I

Public Health Service
Washington, D. C.

17 January 1957

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TRANSCRIPT OF PROCEEDINGS
PUBLIC HEARING
POLLUTION CORNEY DRAINAGE SYSTEM
(ARKANSAS-LOUISIANA)

HOMER, LOUISIANA
JANUARY 16-17, 1957

VOLUME I.

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
TION OF THE INTERSTATE WATERS OF THE CORNEY DRAINAGE SYSTEM
(ARKANSAS-LOUISIANA)

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TRANSCRIPT OF PROCEEDINGS
PUBLIC HEARING
HOMER, LOUISIANA
January 16-17, 1957

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CHAIRMAN:

The hearing will come to order. Ladies and gentlemen, because of the arrangement of microphones, the members of the Board and Counsel will remain seated while speaking.

First, I want to say that the Members of this Board, and others concerned here, appreciate very much the courtesy of the Officials and Townspeople of the City of Homer in making this very fine Meeting Hall available for our hearing.

This hearing, as you all know, relates to the pollution problems of the watershed known as the Corney Drainage System in Arkansas and Louisiana, and it has been called by the Secretary of the United States Department of Health, Education and Welfare, by an Order under the Federal Water Pollution Control Act as it was in effect before the 1956 Amendments, and upon Notice issued by the Surgeon General pursuant to that Order.

I will ask the Secretary of the Board to read the Order of the Secretary of Health, Education and Welfare, and the Notice issued by the Surgeon General.

SECRETARY: (Reading)

INTERSTATE WATERS OF THE CORNEY DRAINAGE SYSTEM ;
(ARKANSAS-LOUISIANA)

PUBLIC HEARING CONCERNING POLLUTION

The Surgeon General of the Public Health Service having found that the persons listed in the appendix below, operating the oil well leases therein indicated, are discharging matter contributing to the pollution of interstate waters of the Corney Drainage System, which originates in the State of Arkansas and endangers the welfare of persons in the State of Louisiana, and

The actions by the Surgeon General with respect to such pollution prescribed under paragraph (2) of section 2 (d) of the Water Pollution Control Act of June 30, 1948 (sec. 2, 62 Stat. 1155, 33 U.S.C. 466a), having been completed prior to July 9, 1956, and

Such persons after second notification of such pollution by the Surgeon General having failed to initiate action to abate the pollution, and

It appearing to me that a public hearing will contribute to the abatement of such pollution;

Preceding page blank

Now therefore, pursuant to section 2 (d) (3) of the Water Pollution Control Act of June 30, 1948 (62 Stat. 1155, 33 U. S. C. 466a), as amended by P. L. 660, 84th Congress, 2d Session (sec. 5, 70 Stat. 507) I hereby call a public hearing to be held in or near one or more of the places where the discharge or discharges contributing to the aforesaid pollution originate and before a hearing board, the members of which will be appointed by me, at a time and place to be fixed by the Surgeon General.

On the basis of the evidence presented at such hearing, said board shall make its recommendations to me concerning the measures, if any, which it finds reasonable and equitable to abate such pollution.

Dated: November 6, 1956.

(Seal) M. B. FOLSOM, Secretary.

SECRETARY: Now, the persons listed in this Notice: (Reading)

APPENDIX- Persons Operating Arkansas Oil Well Leases Discharging Matter Contributing to the Pollution of Interstate Waters of the Corney Drainage System (Arkansas-Louisiana).

VILLAGE FIELD - COLUMBIA COUNTY, ARKANSAS

(TOWNSHIP 17 SOUTH, RANGE 19 WEST)

OPERATOR	LEASE	LOCATION
McAlester Fuel Co. McAlester Bldg., Magnolia, Ark.	J. G. Alexander Est. B-1	SE SE, Sec. 8
Williams, Sellars & Ewing, 903 Candler Ave., Shreveport, La.	J. G. Alexander No. 1	SW SE, Sec.8
McAlester Fuel Co. McAlester Bldg., Magnolia, Ark.	Haskell A-1	SW SW, Sec.9
E. G. Bradham & C.B. Ragsdale, 401 First National Bank Bldg., El Dorado, Ark.	Machen No. 1	SW SE, Sec.9
E. G. Bradham, 401 First National Bank Bldg., El Dorado, Ark.	Machen No. 3	Do.
Do.--------------	E.D.Harris No.1	SW NW, Sec.10
D. E. Bradham, 401 First National Bank Bldg., El Dorado, Ark.	E.D.Harris No. 2	On section line between NW SW, Sec.10 and NE SE, Sec. 9
E. G. Bradham, 401 First National Bank Bldg., El Dorado, Ark.	Tissue No. 1	NW SW, Sec.14
Do.--------------	Harris-Gunnels No. 1	1320' N. 330' E of SWc NE SW (or on line between SE NW and NE SW, Sec.14)
E. G. Bradham & C.B. Ragsdale, 401 First National Bank Bldg., El Dorado, Ark.	Booth No. 2	SE NE, Sec. 14

OPERATOR	LEASE	LOCATION
E. G. Bradham, 401 First National Bank Bldg., El Dorado, Ark.	T. Crumpler No. 1	NW NW, Sec.15
E. G. Bradham & C. B. Ragsdale, 401 First National Bank Bldg., El Dorado, Ark.	Threadgill No. 1	N½ SE¼, Sec.15
Do----------------	Threadgill No. 4	NW SE, Sec.15
Do----------------	A.A.Gunnels No.1	NE NW, Sec.16
Do----------------	J.J.Gunnels No.1	NW NE, Sec.16
E.G.Bradham, 401 First National Bank Bldg.El Dorado,Ark.	J.J.Gunnels No.2	SE NE, Sec.16

SPOTTVILLE FIELD- COLUMBIA COUNTY, ARKANSAS

(TOWNSHIP 18 SOUTH, RANGE 18 WEST)

McAlester Fuel Co., McAlester Bldg., Magnolia, Ark.	T. O. Giles Est. A-1	NW NE, Sec. 6

ATLANTA FIELD - COLUMBIA COUNTY, ARKANSAS

(TOWNSHIP 18 SOUTH, RANGE 19 WEST)

E. G. Bradham & C. B. Ragsdale, 401 First National Bank Bldg., El Dorado, Ark.	Longino-Talley 1-X	S½ S½ SW¼, Sec.11-18-19

SECRETARY: I will now read the Notice of the Surgeon General.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

LLUTION OF THE INTERSTATE WATERS OF THE CORNEY DRAINAGE SYSTEM (ARKANSAS - LOUISIANA)

NOTICE OF PUBLIC HEARING

Take notice that pursuant to the authority sted in the Surgeon General of the Public Health Service by the cretary of Health, Education, and Welfare under date of November 6, 1956 (21FR 8779), a public hearing concerning the pollution f the interstate waters of the Corney Drainage System (Arkansas-ouisiana) will be held at the City Hall Auditorium, Homer, Louisiana beginning at 10:00 A. M. on Wednesday, January 16, 1957, efore a board consisting of the following named persons:

Chester S. Wilson, Chairman
Kenneth E. Biglane
Harold C. Jackson (representing the United States Department of Commerce)
Glen T. Kellogg (representing the Arkansas Water Pollution Control Commission)
Blucher A. Poole

Under findings of the Surgeon General dated une 9, 1954, and amendments thereto, made in accordance with the ater Pollution Control Act (P.L. 845, 80th Cong., as amended, 62 tat. 1155, 33 U.S.C. 466) the persons named in the appendix below perating the oil leases therein indicated, are discharging salt rines, acids, oil spillage and other substances contributing to

llution to the interstate waters of the Corney Drainage Sys-
, which pollution originates in the State of Arkansas and
angers the welfare of persons in the State of Louisiana.

On the basis of the evidence presented at
e public hearing, the Board will make recommendations to the
cretary of Health, Education, and Welfare concerning the
asures, if any, which it finds reasonable and equitable to
ate such pollution.

The failure of any of the persons named in
e appendix below to appear at and participate in the hearing
response to this notice will not delay the hearing and the
ard may proceed, hear and receive evidence, and take other
ppropriate action affecting such party (42 CFR 81.8,21FR 6706)

Notice is further given that other interested
rties or agencies desiring to appear and testify before the
oard may make written application therefor, specifying the
ature of their interest, addressed to the Surgeon General,
blic Health Service, Washington 25, D.C. Such applications
ould be received not later than January 6, 1957.

ated:
Dec. 5 1956

/s/ L. E. Burney
Surgeon General
Public Health Service, Department of
Health, Education,
and Welfare.

SECRETARY: The appended list is the same
the one on the Notice.

CHAIRMAN: So that everyone may know who the different people are that are responsible for conducting the hearing, I will introduce the Members of the Board now, and the attendant Officials:

Beginning on my left, the extreme left, is Mr. Glen T. Kellogg, the Technical Secretary of the Arkansas Water Pollution Control Commission, who represents that agency of the State of Arkansas.

Next is Mr. Harold C.Jackson, the Manager of the Department of Commerce Field Office in New Orleans, Louisiana, who represents the United States Department of Commerce. Mr. Jackson.

On my right is Mr. Blucher A. Poole, who is the Director of the Indiana State Board of Health, the Bureau of Environmental Sanitation of that Department, and is also the Chief Engineer and Technical Secretary of the Indiana State Board of Health Stream Pollution Control Board.

On the extreme right is Mr. Kenneth E. Biglane of Baton Rouge, Louisiana, who is the Executive Secretary of the Louisiana Stream Control Commission, and is also the Chief of the Division of Water Pollution Control of the Louisiana Wildlife and Fisheries Commission.

And I am Chester S. Wilson, a lawyer of Stillwater, Minnesota, and formerly the Commissioner of Conservation, and Chairman of the Water Pollution Control Commission of that State, and Chairman of this Board.

I wish to introduce some of the others who will assist the Board:

Mr. Robert R. Harris is the Secretary of the Board, and will have charge of all the exhibits and other records of the proceedings. He is Field Liaison Officer on the staff of the water supply and water pollution control program of the United States Public Health Service.

The Recorder of this hearing, who is at the recording instruments over there, is Miss Hazel Autrey, Official Court Reporter, of Shreveport, Louisiana.

And we have the courtesy of the services of Mr. J. J. Smith, Clerk of the District Court of Claiborne Parish, Louisiana, who is seated over there, and who will administer the oath to witnesses. All witnesses testifying at the hearing must be sworn the same as in Court.

I think that completes the introductions, and we will now proceed to enter the appearances of all parties to the hearing:

First, for the Surgeon General and Government Agencies, will the Counsel or Officials of the Surgeon General's office announce their appearance?

MR. MURRAY STEIN: We would like to announce the appearance of Mr. Murray Stein, Chief, Interstate Enforcement Section, Water Supply and Water Pollution Control Program of the Public Health Service; Mr. Sidney Edelman, Attorney, Office of the General Counsel of the Department of Health, Education, and Welfare, and Mr. Harold Stafford, Regional Attorney, Region 7, of the Department of Health, Education, and Welfare.

CHAIRMAN: Are there any other Government Agencies who wish to enter an appearance? If not, we will proceed with the State Agencies. Are there appearances for any State Agency of the State of Louisiana?

MR. BIGLANE: Mr. Chairman, we have a representative this morning, representing the Director of Wildlife and Fisheries Commission, Mr. John S. Campbell. Mr. Ernest Epps, representing the Department of Agriculture, a member of the Stream Control Commission, and Mr. John Trigg, a member of the Stream Control Commission. Mr. Trigg will make a statement later.

CHAIRMAN: Are there any other appearances for Agencies of the State of Louisiana? If not, the Agencies of the State of Arkansas.

MR. KELLOGG: The State of Arkansas is represented here today by Leonard N. White, Commissioner of the Arkansas Water Pollution Control Commission. We also have Mr. Trotholder, a Commissioner with the Arkansas Water Pollution Control Commission, and Mr. Bill Apple is down here representing the Wildlife Federation.

CHAIRMAN: Are there any other appearances for the State of Arkansas? If there are any other appearances of official agencies of the State of Arkansas, will they please step forward and state their appearance?

MR. M. L. WOOD: M. L. Wood, Director of the Arkansas Water Pollution Control Commission. The Commission has no additional evidence, but it does have a statement which it will present when called upon to do so by the Chair.

CHAIRMAN: You will have that opportunity in the order of business. Are there any other appearances for the State of Arkansas?

Then we will ask any of the parties who were charged with responsibility for causing or contributing to the pollution in the list read by the Secretary to enter their appearance, either in person or by counsel. Are there any who wish to enter such appearance?

MR. STERLING S. LACY, JR: I am Sterling S. Lacy, Jr., representing McAlester Fuel Company, Magnolia, Arkansas. I have a statement to make in behalf of McAlester Fuel Company at the time the Chair wishes the statement to be heard.

CHAIRMAN: That will be permitted in the order of business. Next?

MR. C. V. BLANCHARD: My name is C. V. Blanchard, representing E. G. Bradham, C. B. Ragsdale and D. E. Bradham. I have a statement to make when the Chair wishes to recognize me.

CHAIRMAN: You will have the opportunity. Are there any others?

We have three parties who made written application in advance to be admitted as parties to the proceeding through communications to the Surgeon General. Mr. Wood, I believe, has already personally appeared, the Director of the Arkansas Water Pollution Control Commission, and then there was Mr.

William H. Apple, Secretary of the Arkansas Wildlife Federation and Regional Director of the National Wildlife Federation. Is he present?

MR. APPLE: Yes, sir.

CHAIRMAN: Your appearance has been entered upon your application, Mr. Apple, and you will be given an opportunity to present your statement at the proper time.

The Lion Oil Company also requested to be admitted. Is there a representative of the Lion Oil Company present? No one appears, but if they have a written statement, it will be entered in the record at the proper time. Do you have something on that, Mr. Harris?

SECRETARY: I understand that they will be here this afternoon.

CHAIRMAN: The Secretary states that a representative of the Lion Oil Company will be here this afternoon, and upon his appearance, he will be entered as a party.

Because of the limitations of time and the amount of ground to be covered, it is not possible to throw this meeting open to a free-for-all discussion. It is a legal hearing, and has to be conducted after orderly procedure.

We wish to give everyone who has any material interest in this matter an opportunity to be heard, but in order to save time, and make the best use of the time, we have to limit those presentations to people who declare their appearance, or their desire to appear as parties, in advance. And under the regulations, in addition to those regular parties to the proceeding who have already entered their appearance, the Board may admit as parties others having an interest in the proceedings who wish to either present evidence, cross-examine witnesses, or submit statements or arguments. And in order to have an orderly procedure, we are obliged to limit the participation in the hearing in those ways to people who now come forward and make a request of the Board to be admitted as parties.

So, if there are any other representatives of organizations, or industries, or public agencies, local agencies, who wish to be admitted as parties to the proceeding, and take part in the ways that I mentioned, will they now come forward, please, and make that request, and then the Board will consider their interest in the proceeding and decide if they should be admitted as parties. If there are any such, will they now please come forward? Apparently there are none except those who have already filed written applications.

The order of procedure at the hearing will consist first of the presentation of evidence of the facts, and that will follow the customary procedure in such matters. The representatives of the Surgeon General's office will first present the case for the Government, and that will be followed by anything that the State Agencies of the States of Louisiana and Arkansas may wish to submit; then the oil companies or operators who have been charged by the Notice with responsibility for the pollution will have their opportunity, and then these parties here who have made written request to be admitted as parties will have their chance, and that will conclude the presentation of evidence.

During the presentation of the evidence, the witnesses will be sworn, of course, and we will ask all witnesses to come forward and use that chair and microphone immediately to the right of the Clerk. After they have concluded their testimony, then the opportunity for cross-examination will be given to the different parties who have registered, in the order that has already been listed. After those parties have presented their cases, and others listed have presented theirs, there will be an opportunity for the parties to submit arguments, or summaries of the evidence to the Commission, and that will be taken in reverse order to the submission of the evidence, with the Government submitting their summary and argument last.

We will now proceed to the consideration of the evidence to be submitted by the Surgeon General. Mr. Stein, you may proceed.

MR. STEIN: Mr. Chairman, Members of the Board: This is an enforcement proceeding under the Federal Ware Pollution Control Act. That Act provides that pollution of interstate waters, where the discharge originates in one state and endangers the welfare of persons in another state, is subject to abatement under the procedures of the Federal Act.

I think that there can be no doubt, as the evidence will show, and as the maps which will subsequently be identified (on the other side of the room) clearly show that the Corney Drainage System, crossing a state line, is clearly an interstate water within the meaning of the Federal Act.

Further, I think the case will clearly show that the oil well discharges in Arkansas clearly endanger the welfare of persons in Louisiana, a state other than that where the discharges originate.

This case involves waters known collectively as the Corney Drainage System. It consists of Corney Creek and Three Creeks, streams draining from Arkansas into Louisiana, which, together with their tributatories, form Corney Bayou. These waters then flow into a nineteen hundred forty acre impoundment in Louisiana known as Corney Lake. Thence, these waters known as Corney Bayou and Bayou D'Arbonne flow southward generally until they form a confluence with the Ouachita River.

Corney Lake is a nineteen hundred forty acre impoundment, constructed in 1938 by the Federal Government. This lake is now under the jurisdiction of the United States Forest Service, and the lake and its surrounding land area is used for the purpose of forest production and recreation.

I think that the Government will show that this lake, just after it was constructed in 1938, was a diadem of recreation for the people of this community. The people used this lake and were flocking to it for extensive fishing and bathing and other recreational facilities. However, ironically enough, in 1938, when the lake was completed, or just about that time, the first oil wells began producing in Arkansas, and these oil wells draining into the Corney Drainage System.

At first, there were just a few wells, and the oil brine production was not very great. However, the States of Louisiana and Arkansas heard reports of interference with recreational uses of these waters as early as 1941. I think, even before the lake, these waters did provide tremendously good fishing waters, and certainly the use of the waters for such purpose was enhanced greatly by the lake. I think, too, that the normal condition of waters, as will be shown, in this area, provides an excellent habitat for fish lines.

Now, in 1966 and 1967, the oil well leases in Arkansas began to hit relatively high production loads, and gradually, and vociferously, the effects of the pollution became known.

Both the Arkansas State Water Pollution Control Agency and the Louisiana Agency took an active part in informally trying to get this pollution corrected. The effects of this pollution were direct and dramatic, in that they had a very positive impact on the fish life of the creek, changed the complete character of the creek from the usual turbid North Louisiana stream into a relatively clear stream, and, in fact, in places fairly close to the oil wells, presented a limpid clear stream almost devoid of all life except algae and an occasional beetle.

Also, this is sort of a text-book case, since the oil wells operating in Arkansas present the only significant source of pollution in the Corney Creek Drainage area; and we have a further indication of the almost text-book nature of the case when we find that the oil brines act as an indicator to trace the pollution. Very often in cases investigators put dyes or radioactive material in water and try to trace those down. But the characteristics of the oil well discharges are so unique that they provided themselves with a built-in indicator for the investigators.

After this investigation, the official State Water Pollution Control Agency of Arkansas called a public hearing in 1952. Those hearings were held on November 25, 1952, and December 16, 1952. As a result of those hearings, the official Arkansas Agency ordered the oil well producers to cease and desist pollution.

In February of 1953, two of those operators appealed the Order of the Arkansas Commission to the Columbia Circuit Court. To date this appeal has not been heard, to the best of our knowledge.

During this time, and certainly subsequent to the fact that the Arkansas Agency Order was appealed, and the appeal did not come up, the United States Public Health Service began to get requests to take remedial action under the Federal Law. We did receive such requests from the Claiborne Parish Police Jury, the Lincoln Parish Wildlife Federation, the Louisiana Stream Control Commission, and the Honorable Overton Brooks and Otto E. Passman, Congressmen from Louisiana.

The Surgeon General, in response to this request and the making of surveys and investigations, and the analysis of all the excellent work done by both the Arkansas and Louisiana Water Pollution Control Agencies, made a finding on July 9, 1954. These findings stated that the operators of oil well leases in Arkansas named in the findings were discharging salt brine, acids, oil spillage and other substances which reached the waters of the Corney Drainage System flowing into Louisiana, causing such waters in Louisiana to have abnormal salinity pH and biological productivity.

The Surgeon General further found that these discharges substantially impair the ability of the Corney Drainage System to produce aquativ life normally present in the water and resulted in a number of fish-kills. The types of fish found to be indigenous to these waters included bream, crappie, catfish, bass and pickerel.

The Surgeon General further found that these discharges substantially impair the water of the Corney Drainage System for fishing and other recreational uses, and for potential industrial uses.

These findings of the Surgeon General were amended in May, 1955, and November, 1955, to include additional wells. Repeated inspections have been made of the wells cited in the findings, and ALL of the wells cited in the notice of this hearing were given at least two notices, advising them of the fact that they were contributing to the pollution of the interstate waters of the Corney Drainage System.

There are more than three hundred eighty wells, as a glance at that first map there will indicate, in Arkansas in the Corney Drainage System, and of these, only seventy-five were ever cited by the Surgeon General as contributing pollution; a fairly good evidence that most of the oil well operators did a good job and never contributed to this pollution.

Of the seventy-five wells cited by the Surgeon General, only eighteen now continue to contribute to the pollution. Fifty-seven of the wells have either installed adequate remedial measures, or these wells have shut down. Only three have shut down; fifty-four have adequate remedial measures.

All the wells which have adequate remedial measures have installed injection systems; brine collection and injection systems. That is, they collect the brine produced by the well and re-inject it back into the ground from whence it came.

The eighteen wells which have not had adequate remedial measures installed have installed pits now, earthen pits, which allegedly were built to contain the brine.

Exhaustive and repeated inspection by the Public Health Service has indicated that these pits either overflow, seep, or breech, or are emptied by mechanical means, such as syphons or pipes, and I think we have to question the adequacy of the pit when we find a syphon or a pipe in the side to drain the brine from the pit. When this seepage, breech or drainage takes place, of course, the brine from these pits quickly finds its way into the Corney Drainage System, and thence into Louisiana.

These pits have not proved adequate because of the porosity of the soil in this area. The Government will show that soil tests indicate that pits in this area cannot be satisfactory. Further, the Government will show that the eighteen wells cited in the Notice of this hearing as contributing to pollution of interstate waters are, by their continued discharges, endangering the welfare of persons in Louisiana, and, therefore, their actions are subject to abatement under the Water Pollution Control Act, and these wells have not taken adequate remedial action to abate these discharges.

The Government will also show that the Surgeon General of the Public Health Service has complied with all the procedural requirements of the law in issuing findings, notices, and the conduct of repeated actions and investigations.

The Government will further show that the non-complying oil well operators were given an ample opportunity to abate pollution and comply with the law, and, in fact, the vast majority of oil well operators so cited by the Government did take remedial action.

The Government will show that the pollution created by these discharges in Louisiana is insidiously creeping down the Corney Drainage System. From 1941 to 1949, the pollution was largely felt above Corney Lake. In the years from about 1946 to 1951, the pollution began to be felt in the Corney Lake region. In 1952 or 1953, the deleterious effects of this pollution began to be felt below Corney Lake, down as far as the Ouachita River.

In these wells which did clean up -- and I think if we will note the third map over there, we will note that the Schuler Oil Field did clean up-- Three Creeks, in Arkansas, flowing into Louisiana, drains through the Schuler Field. Since the Schuler Field cleaned up about a year ago, there have been evidences that the waters of that creek are beginning to return to their natural turbid condition, and the fish are beginning to come back to that creek.

In addition, the Government will show that the pollution of the Corney Drainage System below Corney Lake is standing in the way of the development of Lake Bayou D'Arbonne, and that is a proposed lake shown on the furtherest map over here, and marked in blue.

As you will recall, Corney Lake is a little less than two thousand acres. The new proposed lake will range at a minimum of fifteen thousand acres, or a maximum of eighteen thousand acres.

In 1956, the State Legislature of Louisiana passed enabling legislation to get this lake started, and to have a Lake Bayou D'Arbonne Watershed Commission established. The State Legislature of Louisiana also appropriated one million dollars for this purpose, and provided a stand-by appropriation of an additional two million dollars; sufficient funds to survey and get this lake built.

However, this lake must be built for certain purposes, and it can, and the money will be available to build the lake if, within the opinion of the Lake Bayou D'Arbonne Watershed Commission and the State Public Works Department of Louisiana, the proposed lake meets the purposes of the State Act.

Under the State enabling Act, the purposes of the lake were: One: to provide recreation for the people of Louisiana; recreation, largely fisging, but also boating and possibly swimming. Secondly, to provide water for agricultural uses; irrigation; to provide water for industrial uses, and to provide water for municipalities; public water supplies.

I think the Chairman of this Watershed Commission will indicate that on all four counts the water of Corney Bayou which flows into this proposed impoundment would make the water unsuitable for all of these four purposes. In other words, we have just eighteen oil well operators up in Arkansas standing in the way of the development of this tremendous resource for this area.

In addition, in view of the fact that fifty-seven oil well operators have taken corrective action in response to the Government's request, we believe that the equities of the situation require that the remaining non-complying oil well operators also install adequate remedial measures.

The Government will show that the continuance of pollution of interstate waters by the small group of non-complying operators has degraded the Corney Drainage System, for a recreational and potential industrial area to the great detriment of this region, and is standing in the way of the development of a new and much larger impoundment below Corney Lake; the proposed D'Arbonne Lake.

Mr. Chairman, that concludes the Government's opening statement, but prior to the presentation of the detailed evidence of the Government's case, I should like the permission of the Chair to read into the record a letter I received from the Honorable Overton Brooks, Member of the United States Congress from the Fourth District of Louisiana.

CHAIRMAN: Yes, sir, you may read that, or any statement submitted. And I may say that just at the opening of the hearing we received a telegram from Congressman Brooks, as follows: (Reading) "Deeply regret official duties in Washington prevent my attending hearing. Have submitted statement for record. Best wishes for most successful hearing. Overton Brooks, Member of Congress." You may proceed to read his statement, Mr. Stein, or have it read by the Secretary, if you wish.

MR. STEIN: Thank you, Mr. Chairman. I think the statement may best be read by the Secretary, if that is agreeable to you.

SECRETARY: (Reading) This statement is dated January 16, 1957, on Corney Lake Pollution.

Mr. Chairman and Members of the Board: I want to thank you for this opportunity to present a statement at this hearing on the pollution of Corney Lake and its tributaries by the oil operators north and northwest ofthe Land Utilization Project.

As you know, I have been vitally concerned over this matter for a long time. It was during World War II that this situation was first called to my attention, and since that time I have worked continually to clear this lake and its watershed of pollution.

We have approached this matter from every possible angle in an effort to speed the clearing of the waters of this watershed and I want to thank you gentlemen of the Department of Health, Education, and Welfare for the progress you have made in view of some very serious delaying obstacles which have been placed in your path. I know, personally, that the seemingly snail's pace trod by your agency at times was unavoidable and that the postponement of this public hearing from September to January was a calculated measure. However, now that your Board is convened, I feel sure that appropriate measures will be put into effect to once and for all correct this situation and clear the waters of Corney Lake.

I would like to give the Board, if I may, a brief history or summary of the problems presented by the pollution of Corney Lake.

Corney and Caney Lakes are Land Utilization Projects which were established by the Department of Agriculture prior to my election into Congress. However, they were completed and have been greatly developed since that time. Both these lakes have proven in the past to be great areas of recreation for the sports and outdoor loving people of Northwest Louisiana, as well as important Agriculture Department developments. They are now operated by the United States Forest Service for forest production and recreation. A great number of our people in North Louisiana and many from the State of Arkansas are attracted by the splendid facilities available at these installations.

Pollution from the oil producing areas in Southern Arkansas was first noticed and reported during the year 1941. The oil-fields of Schuler, Magnolia, Village andAtlanta, through which the tributaries of Corney Lake flow, were releasing pollutants into these interstate waters. Many studies were made of this condition during the years 1941 through 1954. The ultimate result was a finding of interstate pollution by the Surgeon General of the Department of Health, Education, and Welfare on June 9, 1954.

The polluted waters of the D'Arbonne Watershed resulted in numerous fish-kills. Many of friends, some of whom are present here today, have personally seen literally hundreds of dead fish in the waters of the lake following a period of a noticeably and concentrated release of the pollutants from the pits and wells in Arkansas.

Many complaints relative to this situation came to me from time to time during the years of World War II and I discussed the matter with numerous of my friends in and around Claiborne Parish, as well as the several governmental agencies involved. It was generally agreed that, inasmuch as this pollution was primarily coming from the State of Arkansas, that Arkansas should be given an opportunity to correct this situation.

The State of Arkansas was agreeable and did proceed to take what action it could to force the operators in Southern Arkansas to cease running open wells and untenable pits. This action did not prove adequate, however due to strong pressure being exerted in favor of the polluters. While a public hearing was held by the Arkansas Water Pollution Control Commission in November, 1952, and the n issued orders to the operators on Janu- 953 to desist and cease dumping oil field into the tributaries of Corney Lake, no was actually taken against the operators. tically powerful operators filed an appeal Circuit Court of Columbia County, Arkansas bruary, 1953, and there the orders of the Com- n died. To my knowledge, the appeal has been heard or a decision rendered.

The pollution of Corney Lake --once utiful mecca for fishermen from both Arkansas Louisiana - became so bad that not only were ts received of fish-kills in the lake but also rmful effects upon trees and cattle in this a.

I made a survey of this situation concluded that the time had come to request your tment to invoke the enforcement provisions of ater Pollution Act passed by the 80th Congress. rongly urged the local governmental bodies, as as local civic groups, to actively lend their t to my efforts by passing resolutions condemn- this pollution. Copies of some of these reso-

Commission issued orders to the operators on January 6, 1953 to desist and cease dumping oil field brines into the tributaries of Corney Lake, no action was actually taken against the operators. Two politically powerful operators filed an appeal in the Circuit Court of Columbia County, Arkansas in February, 1953, and there the orders of the Commission died. To my knowledge, the appeal has never been heard or a decision rendered.

The pollution of Corney Lake --once a bountiful mecca for fishermen from both Arkansas and Louisiana - became so bad that not only were reports received of fish-kills in the lake but also of harmful effects upon trees and cattle in this area.

I made a survey of this situation and concluded that the time had come to request your Department to invoke the enforcement provisions of the Water Pollution Act passed by the 80th Congress. I strongly urged the local governmental bodies, as well as local civic groups, to actively lend their suppot to my efforts by passing resolutions condemning this pollution. Copies of some of these resotions, which I submitted to you in behalf of the several organizations, are in the records which are before you today.

I was later supported in this request by the Honorable Ott Passman of the 5th District of Louisiana, the Claiborne Parish Police Jury, the Lincoln Parish Wildlife Federation, the Louisiana Stream Control Commission, the Lisbon, Louisiana, Men's Club, and numerous private citizens of both Louisiana and Arkansas.

Mr. Chairman, I feel sure the history and details of the presentation of the first and second notices to the polluters will be brought to your attention in testimony of the enforcement division of your department, and I will not go into this.

Let me conclude this brief summary by saying that the Surgeon General of the Department of Health, Education, and Welfare completed his survey and findings in 1954. Following several lengthy delays, as were set forth under the Pollution Control Act of 1948, Mr. Chairman, you are today holding this public hearing which we sincerely hope is the last round in our long fight to clean up Corney

Mr. Chairman, I would like to point out to some of our friends here who may not fully understand that the proceedings today are being conducted under the Pollution Control Act which was in effect prior to the amendments to the Enforcement Section of the Bill passed by the 84th Congress. As you know, I strongly insisted that a savings clause be inserted in the Bill to specifically cover this Corney Lake case. Provision was made by this clause that where second notices had been sent to the polluters, the Department could proceed against the polluters under the procedures set forth before amendment in 1956. If we had been forced to proceed under the new Pollution Act, it would have been an additional delay in which some operators, who heretofore, have shown no indication of wanting to correct this situation, could continue to pour their waste into these interstate streams and lakes.

I am advised that even after all pollution has ceased, it will take at least a year

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and perhaps longer for the fish to begin spawning again in the upper reaches of the lake and in the streams that feed the lake. You therefore can see, Mr. Chairman, why our people in Northwest Louisiana are most anxious to obtain the cessation of this pollution as rapidly as possible.

I do not want to leave the impression, Mr.Chairman, that I have nothing but words of condemnation for the oil operators of Southern Arkansas. Quite the opposite is true. In the beginning, there were some 75 operators up there who were polluting our waterways. I am pleased to state that 57 of these operators have acted in good faith and have helped to correct an admittedly bad situation. Some of these operators have spent considerable sums of money to establish extensive injection systems to return this brine and by-products of their wells to the bosom of Mother Earth. To these operators should go our most earnest thanks and appreciation for their great sympathetic understanding of the rights of their fellow men in the use of our natural waterways. Indeed, these men are to be commended.

Mr. Chairman, this has been a long hard fight. It has required great patience and tenacity on our part. Your Board will hear the pros and cons of this entire matter here today and presently make your recommendations to the Secretary of Health, Education, and Welfare. I sincerely urge that based upon your recommendations, the Secretary will allow only a bare minimum of time for compliance with your findings and if all pollution of our waterways by these polluters is not stopped within this time limit, that he present the matter immediately to the United States Attorney General for prosecution.

As I have said many times, Mr.Chairman, "industrial development is desirable but this development should not be at the complete expense of wildlife of the community." The people of Louisiana should not be deprived of the active utilization of the natural streams and creeks in our area nor the projects developed by the Department of Agriculture which are dependent upon these waterways for their existence. Until this pollution is completely abated, Corney Lake cannot again take its rightful place as a great recreational area in Northwest Louisiana.

Briefly, let me summarize my efforts relative to this pollution of Corney Lake. In 1941 this pollution came to my attention and I immediately took the lead in this fight. I have worked many thousands of hours in the past 15 years on this, literally made hundreds of telephone calls, dispatched numerous telegrams and untold numbers of letters to interested persons involved. I have even at times had heated arguments with the various federal agencies over their failure to push this program with the proper vigor to stop this gross violation of interstate waters. Over the years, I have kept the Claiborne Parish Police Jury and School Board, local newspapers and our citizens informed of the progress I was making in this fight. I have repeatedly made trips to Louisiana and to the offices of the Department of Health, Education, and Welfare in Washington, as well as attended numerous meetings with our people, and a public hearing held in Arkansas, in an effort to speed action in this matter. This has

n a laborious and painstaking struggle and there
times when one might feel that all our efforts
hopeless because of the strong resistance we
at every turn.

The situation is now bright. Mr.
irman, after all these years of hard work and
ort we are pleased that some action is now being
n and this hearing has been called. I strongly
that swift action be taken to correct this
uation which has been allowed to run on unchecked
so many years. It is only right that our
izens should get some relief from this prolonged
lution which has plagued the D'Arbonne Watershed.

Mr. Chairman and Members of the
rd, I again want to express my appreciation for
is opportunity to present this very brief statement
behalf of our people in North Louisiana. I feel
fident that your recommendations to the Secretary
l be such as to prompt him to take immediate action
correct this situation whereby one small group of
is allowed to violate not only the laws of our
tion in polluting these waters but the laws of the

Almighty in that "One should not take unto oneself that which also belongs to his brother."

Thank you, Mr. Chairman.

SECRETARY: That concludes the statement, Mr. Chairman.

CHAIRMAN: Congressman Brooks' statement will be made a part of the record, and will be given due consideration by the Board.

Now, before the Government proceeds, we had better have an understanding as to the arrangements for other counsel who may wish to enter objections or cross-examine witnesses. We will ask any such counsel to seat themselves at the far end of that table where the witness chair is, and where Mr. Harris just read Congressman Brooks' statement, and use that microphone. So, if there are any counsel for the oil operators, or other parties, who wish to be in a position to make objections, or to cross-examine witnesses, will they now take seats at the far end of that table to the right? (Compliance)

Very well, Mr. Stein, you may now proceed with the evidence on the part ofthe Government.

MR. STEIN: Mr. Chairman, Mr. Edelman will initiate the presentation of this portion of the Government's case.

MR. EDELMAN: I ask that Mr. Richard Shakeshaft take the stand.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the whole truth, and nothing but the truth, so help you God?

WITNESS: I do.

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RICHARD SHAKESHAFT

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. EDELMAN:

Q Will you give your name and address to the Recorder, or have you done that?

A I haven't yet, no. Richard Shakeshaft, employed by the Public Health Service in Washington, D. C., as Public Health Advisor.

Q Mr. Shakeshaft, are you the Official Custodian of the records of the Public Health Service relating to the findings of the Surgeon General and related actions concerning the pollution of the interstate waters of the Corney Drainage System?

A I am.

Q Do you have, as part of your official records, the Findings of the Surgeon General, dated June 9, 1954, and the Amendments to those Findings, dated June 9, 1953, and October 31, 1955?

A I do.

Q I ask you to hand them to me.

A (Witness complies)

MR. EDELMAN: With the permission of the Board, I now offer these Findings and their Amendments as one exhibit, and ask that it be marked Government Exhibit No. 1.

CHAIRMAN: I will ask the Secretary to make a note of the marking and recording of all exhibits, and Counsel for all parties will continue to do as Mr. Edelman has done, to make sure that the identification of each exhibit and the marking put on it by the Recorder is read into the microphone so that it will be in the tape record.

MR. EDELMAN: With the permission of the Chairman, we intend to refer to these Findings and their Amendments just as the Findings of the Surgeon General for the remainder of the hearing.

CHAIRMAN: Well, those are official papers, of which notice may be taken, so as to such papers, it will not be necessary to mark them as exhibits, but simply to refer to them and to their authentication.

MR. EDELMAN: Mr. Shakeshaft, do your records show that formal notifications of these Findings were given to all the operators named therein at approximately the time those Findings were made?

WITNESS: They do.

Q Do you have copies of the notifications mailed to the operators who have been named as parties to this hearing?

A I do.

Q May I have them, please?

A Yes, sir. (Witness complies)

MR. EDELMAN: These documents indicate that first and second notices, and in some cases, supplemental first and second notices, were sent to all the operators named in the Surgeon General's Notice of hearing. I ask that all these notices be accepted in bulk, and that they be marked Government Exhibits Nos. 2 through 24, in accordance with the list which I now hand to the Recorder.

CHAIRMAN: Let them be entered in the record.

MR. EDELMAN: Mr. Shakeshaft, do your records also show that the Water Pollution Control Agency of Arkansas received advice of these notifications?

WITNESS: They do.

Q May I have copies of such records?

A Yes, sir. (Witness complies)

MR. EDELMAN: I have been handed seven documents addressed to the State Water Pollution Control Commission of Arkansas, relating the giving of notice to the operators which has already been introduced. I ask that those documents be accepted in evidence as Government Exhibits Nos. 25 through 31.

CHAIRMAN: Let them be entered in the record.

MR. EDELMAN: Was similar notification given to the Louisiana Water Pollution Agency?

WITNESS: It was.

Q May I have copies of those notifications?

A Yes, sir. (Witness complies)

MR. EDELMAN: I have been handed seven documents addressed to the Stream Control Commission of Louisiana, which I offer in evidence as Government Exhibits Nos. 32 through 38.

CHAIRMAN: Those will be entered in the record.

MR. EDELMAN: I wish to point out that the documents that have been introduced have ached to them Registered Return Receipts, and sk that the letter to which they are attached, nd the receipt, be marked as a single exhibit.

Q Do your records show that copies of the Notice of hearing of the Surgeon General, which was read earlier in these proceedings, was sent to the operators named in that Notice?

A They do.

Q Can you tell me how that notification was made?

A That notification was made by Registered Mail, Return Receipt Requested, and return receipts are attached to the notices.

Q May I have those notices?

A Yes, sir. (Witness complies)

MR. EDELMAN: I offer these documents in evidence, and ask that they be marked as Government Exhibits Nos. 39 through 43.

CHAIRMAN: Those will be entered in the record.

MR. EDELMAN: Were the Arkansas

Louisiana State Agencies notified of this
ng, similarly?

WITNESS: They were.

. May I have copies of those notices?

Yes, sir. (Witness complies)

MR. EDELMAN: I ask that the tice to the Arkansas State Water Pollution trol Commission be received in evidence as vernment Exhibit No. 44, and that the notice to e Louisiana State Stream Control Commission be ceived in evidence as Government Exhibit No. 45.

CHAIRMAN: If you are getting to the category of instruments that are being ven identifying marks as exhibits, perhaps we d better follow the usual procedure on them. e have been admitting these documents that appeared o be official papers as matters of which the Comission could take official notice in any event, but ese papers now appear to be exhibits that require rking and identification, so you had probably better ive them identifying letters or numbers. And we d better have an understanding with the Recorder as to the series of numbers that are to be used for Government exhibits, to be distinguished from those that may be used for exhibits offered by the other parties. What system is being followed by the Recorder of that?

MISS AUTREY: Government No. 1, et seq.

CHAIRMAN: Very well. Then, as to these exhibits, they should be offered to the other counsel to see whether there is any objection. Is there any objection to these exhibits?

MR. KEITH: None, Mr. Chairman.

CHAIRMAN: Then they will be received.

MR. EDELMAN: Do you have a report from the Arkansas Oil and Gas Commission certifying to the identity of the operators listed in the Surgeon General's Notice of hearing, according to the records of that Commission?

WITNESS: Yes, I do. It shows the location of the wells and the ownership.

Q May I have that document, please?

A Yes, sir. (Witness complies)

CHAIRMAN: If there are any of these that you want to call to the attention of the Board as you go along, we will be glad to have them for examination. This is a certificate from the Director of the Arkansas Oil and Gas Commission that these operators named here are listed as operators of record for the oil well leases indicated. Do any of the other members of the Board want to look at it? It is a routine matter. I think that the best practice, Mr. Edelman, would be to have the exhibit given the identifying number by the Recorder, so that you can refer to it when it is identified by the witness.

MR. EDELMAN: I offer that document in evidence as Government Exhibit No. 46.

CHAIRMAN: That will be admitted. And then will you please make sure that the Secretary, Mr. Harris, also gets the identifying number as we go along?

MR. EDELMAN: I have no further questions of Mr. Shakeshaft.

CHAIRMAN: Do any of the other

parties who have been admitted as parties wish to cross-examination the witness as to any of these matters? Or any members of the Board? That is all, then.

(Witness excused)

MR. EDELMAN: I now call Mr. Schroeder.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the whole truth, and nothing but the truth, so help you God?

WITNESS: I do.

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MERLE E. SCHROEDER

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

MR. EDELMAN:

Q Will you identify yourself to the Reporter, please, Mr. Schroeder.

A I am Earl L. Schroeder, District Chemist of the U. S. Geological Survey, located at Fayetteville, Arkansas.

Q Mr. Schroeder, are you the Official Custodian of Records of the United States Geological Survey, showing the results of stream sampling analysis of the waters of Corney Creek and Three Creeks in Arkansas?

A I am.

Q Do you have those records with you?

A Yes, I do.

Q May I see them?

A Yes, sir. (Witness complies)

MR. EDELMAN: I have here three folders of typewritten reports, which begin in May, 1950, for Corney Creek, and May, 1950, for Three Creeks, and which continue to November, 1956, showing chloride content, pH, and also in some cases, flow measurements, and the amount of chlorides.

In order to expedite this hearing, I would like to be permitted to introduce each folder as one exhibit, so that the charts and reports shown therein will be included within a single exhibit, and I offer these to counsel for his examination.

MR. KEITH: Mr. Chairman, we have previously seen these reports, and we have no objection to their being introduced.

CHAIRMAN: They will be received in evidence.

MR. EDELMAN: Mr. Schroeder, I will call your attention to a map ---

CHAIRMAN: I want to ask the Recorder if the exhibit numbers of these papers just offered were read into your tape record?

MISS AUTREY: Yes, Mr. Chairman.

CHAIRMAN: I would like to have you be sure of that. I will leave that to the Recorder. In case the counsel for any party, or any witness, does not state the exhibit number for your tape record, you make sure to call attention to that and see that it is done. What is the number assigned to these exhibits that have just been received?

MR. EDELMAN: Mr. Chairman, may I supply that? The folder marked Government Exhibit No. 47 contains a record of stream flow of Corney Creek, Corney Bayou and Three Creeks for 1956.

CHAIRMAN: Very well.

MR. EDELMAN: And Government Exhibit No. 48 shows the analysis of water of Corney Creek beginning in 1950 through March, 1955. Government Exhibit No. 49 shows the analysis of Three Creeks, beginning in May, 1950, through January, 1955.

CHAIRMAN: Well, if there were any preceding exhibits that were not given the same treatment with regard to reading their numbers into the record, it will be understood that they have been received, because all of them have been admitted without objection.

MR. EDELMAN: Mr. Schroeder, I call your attention to a map on an easel over to your extreme left, which purports to show an area in Louisiana from Corney Lake in the upper left, down through the Bayou D'Arbonne, and thence ----

CHAIRMAN: Will the Clerk put the exhibit number on that map, please? Has it been numbered?

MR. EDELMAN: I would like to introduce it into evidence, Mr. Chairman, after the witness certifies to it.

CHAIRMAN: Well, better have it numbered first, so that you can refer to it when it is being identified.

MR. EDELMAN: That will be Government Exhibit No. 50, that map.

Q Is that an official map produced by the United States Geological Survey?

A Yes, it is, by the Topographic Division.

MR. EDELMAN: I ask that that exhibit which has just been marked No. 50 be introduced in evidence as Government Exhibit No. 50.

CHAIRMAN: Any objection?

MR. KEITH: None, Mr. Chairman.

CHAIRMAN: It will be received.

MR. EDELMAN: I have no further questions of Mr. Schroeder.

CHAIRMAN: Do any parties wish to cross-examine? Or any Members of the Board? That is all.

(Witness excused)

MR. EDELMAN: I would like Mr. Terry to take the stand, please.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the whole truth, and nothing but the truth, so help you God?

WITNESS: I do.

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JUNE TERRY

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. EDELMAN:

Q Mr. Terry, will you identify yourself for the

Recorder, please?

A I am Gene Terry, from Homer, Louisiana, and I work for the United States Forest Service.

Q Where are you presently employed, Mr. Terry?

A I am presently employed with the United States Forest Service as Project Conservationist, in charge of the Corney Lake Project.

Q How long have you been so employed?

A I have been here since October, 1949.

Q You are familiar with the lake, and the purpose of the lake?

A I am.

Q Can you describe for the Board Corney Lake and the purpose of its construction?

A Well, the Project as a whole consists of eighteen thousand five hundred and thirty-three acres, of which twenty-one ----

CHAIRMAN: May I ask whether the people in the back of the room are able to hear the witness, through the recording system?

VOICES FROM AUDIENCE: Yes.

CHAIRMAN: O. K.

WITNESS: Twenty-one hundred acres of this is recreation area and lake. This land was acquired under the Title Three Bankhead-Jones Farm Tenant Act as submarginal land. And the purpose of the Project was to develop the land according to its physical capabilities, and to put it in what it was best adapted to. Also, to furnish employment and recreation for low income families.

MR. EDELMAN: Mr. Terry, when you came to your present position in 1949, can you tell us anything about the condition of the lake and what its reputation was at the time you came here?

WITNESS: Well, at the time I came here in 1949, the lake was polluted, and approximately ninety percent covered with aquatic growths of lily pads and moss, and the fishing was very poor.

Q Did that condition of the lake affect its use for recreational purposes?

A It did.

Q Mr. Terry, do you have records of the use that has been made of the lake in the past?

A I do.

Q These records were maintained by the Government in its operation of the lake?

A They were.

Q Can you tell us what those records show with respect to the sale of fishing permits and the use of the lake by people in this area?

A Yes, sir. It shows a decline in a ten year period --- I have the figures. In 1945, it was twelve thousand five hundred and ninety-four fishing permits. In 1955, it was six thousand two hundred and ninety-four. That shows a loss of six thousand and three hundred in that ten year period. That is the difference in it. Now, on the cabins, we have seven cabins there at the recreation area. Of these, we rent five. The other two are used by the concessionaire. In 1945, it showed that they were used fourteen hundred and twenty-five man days, and in 1955, two hundred and ninety-two;

A decrease of one thousand one hundred and thirty-three.

Q Do you have any count of the people who visited the lake for picnicking?

A Yes. In 1945, our records show forty thousand nine hundred and sixty visitors and picnickers. In 1955, our records show five thousand five hundred and forty. Now, that does not include the people who fish and hunt. That is only picnickers and visitors.

Q But the figures that you gave for 1945 and the figures that you gave for 1955 are of the same type of people?

A That is right.

Q Just visitors?

A That is right.

Q Can you account for this decline in the use of the lake?

A Well, it is due to the condition of the lake; from the lack of being able to fish, from the moss and lily pads, and the clearness of the water, and not being able to catch any fish.

Q May I ask you if, in your opinion, the lake were in the condition that it was reported to have been prior to 1949, when fishing was good, whether the use of the lake would increase?

MR. KEITH: We object to the reported condition of the lake, Mr. Chairman; to his testifying concerning the reported condition of the lake.

CHAIRMAN: Perhaps Counsel had better establish the qualification of this witness to express an opinion on that question a little more clearly. Of course, I think Counsel for the Operators understands that this Board is not bound by the strict rules of evidence, and whatever we receive, we will take for what it is worth, and subject to any objection. But there may be some point to that objection, and I think Counsel for the Government might establish the qualifications of this witness a little more clearly.

MR. KEITH: Mr. Chairman, in

view of the statement that you have made, I will withdraw the question.

CHAIRMAN: Very well. You may proceed.

MR. EDELMAN: The Government will have other witnesses to establish the condition of the lake.

Q May I ask --- I will rephrase the question to avoid any problem on that score. Mr. Terry, are you familiar with the natural condition of waters in this part of Louisiana?

A I am.

Q If this lake were in the natural state that occurs in other waters which are unaffected by pollution, can you tell us, in your opinion, the extent of the use that would be made of the lake for recreation?

A Well, that would only be an assumption, but I assume it would be used to its fullest capacity.

Q In other words, more people would visit the lake in that state than visited it in 1955; that is just your assumption?

A That is right.

Q All right. Is that lake used for swimming, Mr. Terry?

A No.

Q Do you permit swimming in the lake?

A We do not.

Q Have you had any experiences with respect to people who actually entered the water of the lake, including yourself?

A Well, we have had one incident where the boys worked in the water, that their hide, or skin, did peel off.

Q Mr. Terry, did you ever observe any fish-kills in this lake?

A I have.

Q Can you tell us about them?

A Well, in 1952, we had our first major kill after I came to the Project, which was in the upper portion of the lake, above what at that time was Highway 115. Then we had another major kill in August of 1955, in the lower part of the lake, near the dam. Then we have for a major kill since [illegible]; up until the present, there hasn't been any time that you could not find a few dead fish.

Q When you characterize these earlier kills as "major kills", can you give us an estimate of how many fish you saw?

A Well, I didn't count the fish. I would say they were up in the thousands, because the bottom of the lake, any place you looked, was covered with small fish.

Q Mr. Terry, did you ever put any metal into this water of the lake?

A We have.

Q And what happened to that metal?

A Well, after two years, we removed the metal from the lake, and it was corroded from the water.

Q Do you have any of that metal with you?

A I do have.

Q May I see it?

A Yes, sir. (Witness complies)

Q Mr. Terry, from what was this piece of metal timely.

CHAIRMAN: Before you proceed further with that, you had better have that given an exhibit number, so that you may refer to it.

MR. EDELMAN: I will ask that this be marked as Government Exhibit for identification No. 51.

CHAIRMAN: No. 51.

MR. EDELMAN: Can you tell us what this metal was a part of?

WITNESS: This is a piece of sheet piling, which has been split open, and was used as a track to launch a mowing boat.

MR. EDELMAN: Mr. Terry, I ask you to describe the condition of this piece of metal for the record.

CHAIRMAN: Before the witness proceeds with any description, you had better have it offered. Has Counsel any objection?

MR. KEITH: None, Mr. Chairman.

CHAIRMAN: It will be received. You may proceed.

WITNESS: This piece of metal, as you can see, is pretty well corroded. We have a similar piece of metal, but I don't have it with me--I left it at the office. I will present this other piece of metal as corresponding with this, since they are of the same type and came out of the same construction, only the other piece of metal was not in the water.

MR. EDELMAN: Have you had experience with metal placed in the natural waters of this area, Mr. Terry?

WITNESS: Yes, I have placed other metals in other waters, and wells, and so forth, in this area.

Q. Has it been your experience that the metal that you have placed in the natural waters exhibited the same degree of corrosion over the same period of time?

A No, this is, to my knowledge, about the worst corroded metal that I have had any dealings with.

Q Mr. Terry, I don't recall, but would you tell

How long was that metal in the water?

A That metal was in the water a little better than two years.

Q Can you tell us about when that was; what years those were?

A It was put in the water in the early part of 1952, and we removed it in 1954.

Q Did you ever travel up-stream above Corney Lake in Louisiana?

A I have.

Q Can you tell us what you observed in the waters of Corney Creek above the lake?

A Well, the only trip that I can refer to that was a continuous trip from the main lake up Corney Creek was made in 1952; in June of 1952, I made a trip from the dam on Corney Lake to what is known as Barber's Ford on Corney Creek. At that time, the water was clear; you could see ten, twelve, fifteen feet, any place in the lake, but after crossing Highway 115, it was at that time --- it is Highway 9 now -- we didn't see any living [illegible] there to Harbor's Ford.

Q Mr. Torry, based on your experience with water in the natural condition in this area, was that a normal condition for those waters?

A I would say not.

MR. EDELMAN: I have no further questions.

CHAIRMAN: Any cross-examination?

CROSS-EXAMINATION

BY MR. KEITH:

Q Mr. Torry, have you made any trips up the stream since 1952?

A Not any continuous trip, no, sir.

MR. KEITH: That is all, sir.

CHAIRMAN: Do any other parties wish to cross-examine? Do any members of the Board have any questions?

EXAMINATION

BY MR. BIGLANE:

Q Mr. Torry, in your testimony you stated that this piling came from a launching ramp for a mowing boat. Am I to understand that you did some mowing in the lake?

A Yes, we did extensive mowing in 1951, 1952, and 1953.

Q Why was this necessary, Mr. Terry?

A We thought we were eradicating the moss and lily pads.

Q Do you mean that moss and lily pads covered such an area of the lake that mowing seemed to be feasible?

A Yes, sir. You couldn't run a boat anywhere in the lake other than in the channel. Far as any of the shallow water in the main part of the lake, you could not run a boat.

Q Then that cut down on the surface area for fishing in this lake?

A That is right.

Q Recall back to a year, or a period where this surface area was covered to a great extent, then how much ofthe area was available for fishing, of the twenty-one hundred acres?

A Well, Mr. Chairman, it would be strictly an estimate, or a guess. I would guess about twenty per cent of the actual water area was available for open water fishing.

Q Twenty per cent of the entire lake was available for open water fishing?

A That is right.

Q Mr. Terry, you stated that one of your employees, or one of your co-workers, had received irritations to his hide, I believe you stated; his skin. Did you imply that this water might have done that? Is that what you meant to imply?

A Well, I'll put it this way: He was in the water, and if that wasn't what it was, I don't know what it could have been..

Q Yes, sir. Well, would you drink this water from Corney Lake?

A I would not.

Q Would you recommend to the tourists and the fishermen that come out there that they drink this water?

A No.

MR. EDELMAN: No further questions.

CHAIRMAN: Any further questions?

RE-CROSS EXAMINATION

BY MR. KEITH:

Q Mr. Terry, are moss and lily pads peculiar to streams contaminated with salt water?

A That I do not know. I'm not a biologist.

MR. KEITH: That is all.

CHAIRMAN: Any other questions? That is all.

(Witness excused)

MR. EDELMAN: I call Mr. Krause to the stand.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the whole truth and nothing but the truth, so help you God?

WITNESS: I do.

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KEITH S. KRAUSE

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. EDELMAN:

Q Will you identify yourself for the record, Mr. Krause?

A My name is Keith S. Krause. I am Assistant Regional Engineer for the Region 7 Office of the United States Public Health Service, in Dallas, Texas.

Q Mr. Krause, can you tell us something of your education and experience?

A Yes.

MR. KEITH: We will admit his qualifications.

CHAIRMAN: Very well. Go ahead, Counsel.

MR. EDELMAN: His qualifications as an engineer?

MR. KEITH: That is right.

MR. EDELMAN: Thank you.

Q Mr. Krause, in the course of your official duty, did you familiarize yourself with the area which is described as the Corney Drainage System?

A Yes, I did.

Q How did you do that? If you are going to use any of these maps, I would like you to point to the map you intend to use so I can have it given an exhibit number.

A Yes, in the course of the investigations, I did cover the areas outlined on those respective maps.

Q I direct your attention to the map on your right as you face it, and ask you whether that is an accurate representation of the area shown thereon with respect to the streams and roads shown there?

A That is an accurate representation of the area.

CHAIRMAN: Now, just a minute, Counsel. That map has not yet been given an exhibit number, I believe. The only one that has so far been identified is the United States Geological Survey map, is it not?

MR. EDELMAN: Will the Reporter please give that an exhibit number? What is it?

MISS [illegible]: No. 52.

MR. EDELMAN: No. 52. I ask that that map be received in evidence as Government Exhibit in evidence No. 52.

CHAIRMAN: Let it be received.

MR. EDELMAN: I ask that the map to the left of that map be marked as Exhibit for identification No. 53.

(Exhibit so marked)

MR. EDELMAN: Mr. Krause, I direct your attention to the Exhibit No. 53, and ask you whether that is an accurate representation of the area shown thereon, and the location of oil leases thereon indicated?

WITNESS: Yes, that Exhibit No. 53 is an accurate representation.

MR. EDELMAN: I ask that that exhibit be received as Government's Exhibit in evidence No. 53.

CHAIRMAN: Let it be received.

MR. EDELMAN: I now ask that the

o the left of that can be marked for identi- ion as Exhibit 54.

(Exhibit so marked)

MR. EDELMAN: Mr. Krause, I direct attention to that map, which purports to show leases in the Schuler, Pine Tree, Atlanta, Vil- and Magnolia Fields, and ask you whether that accurate representation of the area and the ion and number of wells thereon indicated?

WITNESS: Yes, that is an ac- ate representation.

MR. EDELMAN: I ask that that map received in evidence as Government Exhibit No. 54.

CHAIRMAN: Let it be received in idence.

MR. EDELMAN: Mr. Krause, can you ll us what the term "Corney Drainage System" means its technical sense?

CHAIRMAN: I hear the noon istle. I assume you are offering all these maps evidence; that is Exhibits Nos. 52, 53 and 54?

MR. EDELMAN: They have been offer-

and they have been accepted, Mr. Chairman.

CHAIRMAN: That's all right. There is no objection on the part of the opposing counsel?

MR. KEITH: May I ask just one question, please, sir?

CHAIRMAN: Yes, sir.

MR. KEITH: Did you personally supervise the preparation of these maps?

WITNESS: I did not personally supervise the preparation of these maps.

MR. KEITH: I rather doubt that they are admissible as exhibits to this witness' testimony, but I have taken a hurried look at the maps, and I believe that they are correct, so I think that we are going to agree that they may be admitted without objection.

CHAIRMAN: Well, are you ready to make that admission now, Counsel?

MR. KEITH: Yes, sir.

CHAIRMAN: Then Exhibits Nos. 52, 53 and 54 will be received, and we will recess until one-thirty.

[illegible]

CHAIRMAN: The meeting will come to order.

Several officials have come to us during the noon hour and stated that they have to get away early, and have asked the privilege of being heard out of order. So, with the permission of Government Counsel, we will suspend the Government case for a little while in order to permit that.

Among those who requested that privilege were State Representative James Pomeroy of El Dorado, Arkansas, and the representatives of the Arkansas Commission.

We would be very glad to hear from you, Mr. Pomeroy, if you wish to make a statement at this time.

As I understand it, you just want to make a general statement; you don't wish to be sworn as a witness?

MR. JAMES POMEROY: That's right, sir.

CHAIRMAN: Very well, sir; you may proceed.

MR. [illegible]: Mr. Chairman, my name is Jim [illegible]. I am a member of the House of Representatives for the State of Arkansas from Union County, Arkansas. El Dorado is my home.

This particular hearing is of tremendous interest to me personally, and to my many friends who have worked with me since about 1950 toward the elimination or the abatement of pollution in South Arkansas.

We have made many, many trips before the Game and Fish Commission in Arkansas, and before the Water Pollution Control Commission, in protest of the various problems, and we have learned of some of the problems of our agencies, and, of course, we sympathize with them.

And my main purpose in being here today -- I have taken leave of the State Legislature, which is in session today -- I have taken leave to come down here today to discuss with others the problems of possibly what can be done toward strengthening the laws in Arkansas to continue our fight, and to eventually completely eliminate the pollution problem.

I know that there are many people here today who are familiar with my voice, and know that I have been active in this fight, and I feel like that as a Representative of the State of Arkansas, and from South Arkansas, that my assurance should come to these people from North Louisiana to let them know that all of us in Arkansas do not want this pollution to continue, and that I will do everything in my power as a member of the House to try to introduce some legislation to enforce or to strengthen our laws; our existing laws to date.

I want to thank this Chairman and the members of this Board for this opportunity to appear before you, and it has been a pleasure.

CHAIRMAN: Your statement will be made a part of the record, Mr. Pomeroy, and duly considered by the Board.

The representatives of the Arkansas State Agencies asked permission to be heard because [illegible] to [illegible] this afternoon. And I am assuming that both the Water Pollution Control Commission and the Game and Fish Commission will wish to make statements. Will their representatives please appear and make their statements?

MR. W. M. APPLE: Thank you, Mr. Chairman.

CHAIRMAN: Will you state your name and position for the record?

MR. APPLE: W. M. Apple of Little Rock, Secretary of the Arkansas Wildlife Federation.

I am Secretary of the Arkansas Wildlife Federation, an organization representing the sportsmen of Arkansas. I am also past President of the Outboard Boating Clubs of America, and am presently on the Board of Directors of that organization. This is a nation-wide organization, vitally interested in the recreational aspects of water development in this country. I am also a Director in the National Wildlife Federation, as well as a member of the Executive Committee for [illegible] of Water Problems in Arkansas, as appointed by Governor Faubus of Arkansas.

This particular case has not come before the board of any of these organizations but we are constantly striving for adequate control of pollution, both locally and nationally. The National Wildlife Federation has been fighting for a long time to get an effective means of coping with pollution and we are most anxious to see that progress is made and pollution abated. As you know, this is the first test case under the Federal Pollution Control Act, and, for that reason, the success or failure to reduce pollution in this particular drainage area will have an impact which will be nation-wide.

The history of pollution in this drainage area dates back to at least 1941 and has grown progressively worse. Back in August of 1941, Logan and Cusaschs studied and issued a report which revealed the presence of salt water in Corney Bayou and Three Creeks. Another study was made in 1943 by Peter Dudoroff, and ten other studies have been made since that [illegible] confirmed the original study has revealed a [illegible] in the amount of pollution.

I would like to inject here that the Water Study Commission, as appointed by Governor Faubus, has developed some alarming facts and has brought very forcibly to our attention the fact that we must be very careful in the handling of our water for not only present but future use. Our growing industrialization and increasing population will make demands on our water never before recorded. For this reason, if no other, the Water Study Commission is vitally interested in keeping all waters free of pollution and in a reusable condition, where it may be of benefit to all mankind.

We also recognize that pure water is a vital necessity to Arkansas, not only from a consumptive standpoint, but for industry, agriculture, and recreation. Except in rare cases, water with a salt content is unfit for consumptive, industrial, or agricultural purposes.

Recreation has become one of our most important [illegible] plays a very important role. Much of the Arkansas recreation is built around the scenic value of water, as well as boating and fishing opportunities.

I can assure you that the sportsmen of Arkansas, as well as those throughout the Nation, are interested in a speedy culmination of this particular problem since it does have a national significance.

I, therefore, beg to submit this statement for your serious consideration.

CHAIRMAN: Your statement will be entered in the record and duly considered by the Commission.

Anyone else from Arkansas who wishes to be heard at this time? What about your State Agencies, Mr. Kellogg? Do they want to make a statement now? If not, are there any other parties who have previously recorded their appearance who need to get away in a hurry and would like to be heard out of order at this time?

MR. F. E. STEELE: I would like to make a statement on behalf of Lion Oil Company.

CHAIRMAN: Yes. It was announced this morning that the Lion Oil Company had made a written request, and on that request you were admitted as a party. So, will you give your name and address and position to the Recorder, please?

MR. STEELE: My name is F. E. Steele, from El Dorado, Arkansas, and I am General Superintendent of Production for Lion Oil Company.

At the request of Mr. J. B. Anderson, Regional Biologist of the Department of Health, Education, and Welfare, the following is a statement relating to Lion Oil Company's efforts to prevent salt water and oil pollution of the Corney Drainage area:

During 1944, Lion, along with other operators in the Schuler Field, constructed a salt water disposal system to inject produced salt water into the Wilcox Formation. Later, injection into the Wilcox sand was discontinued, and the water is presently being disposed of into the Jones Sand as a part of the Schuler [illegible] maintenance operation. All of the wells within the Schuler Unit boundary, both Unit and non-Unit wells, are connected to the Schuler Salt Water Disposal System.

Just south of the eastern portion of the Schuler Unit, there are six wells generally considered as part of the Schuler Field that dispose of water to surface pits, none of which wells produce more than five barrels of water per well per day. This water is being satisfactorily taken care of by evaporation from the surface pits.

CHAIRMAN: May I interrupt you just a minute, Mr. Steele, with the same statement that I made to the preceding gentleman. You are now making some statement of facts. Do you wish to be sworn as a witness so that these matters will appear in evidence as coming from your own observation?

MR. STEELE: Yes, sir, that's perfectly all right.

CHAIRMAN: Well, then, let me ask again, are you under some necessity of getting away early?

[illegible]: I need to get away within the next hour.

CHAIRMAN: Well, then, we will permit you to go on out of order; otherwise, the representation for the oil companies in the regular order of business would be made after the Government gets through its case. So, you understand that we have suspended their presentation for the moment to permit a few people to make their statements because they have to get away.

MR. STEELE: This statement would require about three minutes.

CHAIRMAN: But you do say that you would like to have it recorded as part of the evidence, as something coming from your observation?

MR. STEELE: Yes, sir, either that, or as a statement.

CHAIRMAN: You had better be sworn as a witness then.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the whole truth, and

[illegible]

WITNESS: I do.

CHAIRMAN: And it will be understood that your oath will apply to what you have already read in the record.

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F. E. STEELE

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appearing as a witness on behalf of Lion Oil Company, having been first duly sworn, testified further as follows:

WITNESS: The Schuler Salt Water Disposal System is presently injecting three thousand barrels of water per day into the Jones Sand. A total of only seventeen barrels of water is being disposed of to pits from those wells in the Schuler Field not connected to the disposal system. The total investment in the Schuler Salt Water Disposal System, excluding operating costs, has been a hundred and eighty-seven thousand dollars. This system has disposed of, underground, 21,800,000 barrels of salt water.

Lion Oil Company participates in the Magnolia Smackover Lime Unit wherein the water is being utilized for pressure maintenance purposes.

Lion Oil Company also participates in the Atlanta Salt Water Disposal System which collects water from the Lion's properties in the Atlanta Field for injection into the Smackover Lime.

Lion is part owner and Operator of the LaGrone and "B" Sand Unit Salt Water Disposal System which collects all produced water from the two units and utilizes the water for pressure maintenance purposes.

The Pine Tree Salt Water Disposal System was completed by Lion in 1954 at a cost of $19,600.00 for the sole purpose of disposing of the water produced by Lion's three wells in the field.

Referring again to the Schuler Salt Water Disposal System, Lion's engineers at regular monthly intervals collect samples of water from twelve check points on streams within the Schuler Unit boundary, and have those samples analyzed for chloride content. This procedure gives close control on the character of the water in the streams entering and leaving the Schuler Unit boundary.

In the Corney Drainage area, Lion operates only three wells not connected to an underground disposal system, and these wells produce a total of only eleven barrels of water per day, which is disposed of by evaporation from surface pits. These wells are located approximately one mile from the Schuler Salt Water System. If water production from these wells should materially increase, consideration will be given to connecting them to the salt water disposal system.

Lion Oil Company has made a sincere effort to prevent pollution of the Corney Drainage area, and, except for an occasional line leak, there is little or no possibility of water from Lion's wells entering the Corney Drainage area.

In addition to the above actions, Lion is conducting an educational program among its employees pointing out the importance of good housekeeping in preventing pollution.

[illegible]

MR. EDELMAN: Mr. Chairman, I [illegible]. I would like to examine him a few questions if I may.

EXAMINATION

BY MR. EDELMAN:

Q I don't believe you stated your position with Lion Oil Company, Mr. Steele?

A My position is General Superintendent of Production.

Q What formation do the wells in Schuler Field that are in your injection system lie in?

A Well, the water is produced from all ofthe sands above the Smackover Lime; that is, Cotton Valley, Travis Peak, Tuscaloosa, and the water at Schuler now is being injected into the Lower Cotton Valley Sand for repressuring purposes.

Q Can you tell us whether in your experience in that field you have found the brine produced there to be corrosive?

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A [illegible]

[illegible]

[illegible]

Q Mr. [illegible], you [illegible] indicated that you have an injection system. Can you tell us your experience with the use of pits to retain substantial quantities of lime production from oil wells in that field?

A We do not think that pits are generally successful for substantial volumes of water. I don't know just what I would call a substantial volume of water; possibly as much as a hundred or two hundred barrels a day. However, a pit will satisfactorily handle water up to the extent that evaporation would take care of it and prevent the pits from filling.

MR. EDELMAN: Thank you. The Government has no further questions.

CHAIRMAN: Other Counsel any questions?

MR. KEITH: No questions. Mr. Chairman.

[illegible]

[illegible]

MR. [illegible]: Thank you.

CHAIRMAN: Now, were there any persons who wished to be heard out of order? If not, then the Government may proceed.

MR. EDELMAN: We would like to recall Mr. Krause to the stand.

(Witness resumes stand)

DIRECT EXAMINATION CONTINUED

BY MR. EDELMAN:

Q Mr. Krause, you were sworn earlier this morning, and that oath, of course, applied to the testimony you are about to give. As I recall, this morning, we had completed identifying the maps behind you. Now, are you familiar with the number of wells in all of the fields which are indicated on those maps; that is, Schuler, Atlanta, Pine Tree, Magnolia and Village Fields; Spotsville Field, too?

A Yes, I am.

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[illegible]

Q Now, earlier this morning, it was indicated that these [illegible] were part of the Corney Drainage System. Can you tell us technically what a drainage system is?

A A drainage system is a surface configuration of the earth in which the water which runs off reaches a common channel and eventually a common outlet.

Q Are the streams which are indicated on those maps a drainage system?

A Yes. The streams indicated on this map, including their tributaries, constitute the drainage system known as the Corney Drainage System.

Q Does that drainage system extend from headwaters in Arkansas and descent into Louisiana to the Bayou D'Arbonne and thence to the Ouachita River?

A Yes. The headwaters of the Corney System [illegible] Creek, [illegible] Corney Creek, Beech Creek and [illegible], Little Corney Creek, [illegible] Creek, [illegible] Creeks, which is a rather substantial tributary of Corney, and Franks Creek. (Indicating) These creeks flow together at a junction above the upper end of Corney Lake, and thenceforth the stream is known as Corney Bayou. It flows then through what is now known as Corney Lake, and thence ---

CHAIRMAN: Before you proceed to the next map, will you state for the record the exhibit number of the map to which you were just pointing?

WITNESS: Yes. This is Government Exhibit No. 52.

CHAIRMAN: And when you point to any of the maps after this, please give the exhibit number, so it will show in the record.

[illegible]

([illegible] proceeds south-ward [illegible] Louisiana, [illegible] joins, at a point near Farmerville, Louisiana, with Bayou D'Arbonne, and is thenceforth known as Bayou D'Arbonne to its confluence with the Ouachita River.

MR. EDELMAN: Mr. Krause, are you familiar with the producing formations in the Village Field, Spotsville and Atlanta Fields?

WITNESS: The producing formations in the fields which you have mentioned are generally the Travis Peak, the Cotton Valley and the Reynolds Lime.

Q Can you tell us whether the wells which are cited in the Surgeon General's Notice lie within those formations?

A Yes. There may be one additional formation in the Village Field.

Q But otherwise the wells do get their production [illegible] formations produce [illegible] gas, water and oil.

Q Will you tell the Board the characteristics of the water that is produced from those formations?

A The characteristics of the waters produced from these formations can generally be characterized by the following examples, which were subject to analysis: These contain solids content in waters originating from the Cotton Valley of approximately 202,000 parts per million. The chloride content of this same water as sodium chloride is approximately 188,000 parts per million. The water also contains sulphides to the extent of two-tenths of a part per million, iron, 84 parts per million, and aluminium, 64 parts per million.

Analysis of the wells will vary somewhat from this, but this is a gener-

[illegible]

[illegible]

[illegible] from the Reynolds [illegible] formation contain somewhat higher total solids content. The sample analyzed from which I am reading indicates that there is something in the neighborhood of 341,000 parts per million of total solids; that the chloride content as sodium chloride was 296,000 parts per million, and that this formation also contains sulphates in the amount of 180 parts per million, and sulphides to the extent of 9.1 parts per million, iron, two parts per million, and aluminum, three parts per million.

Waters taken from the Travis Peak formation and analyzed at this particular time indicated that they ran in the neighborhood of 178,000 parts per million total solids, and 164,000 plus parts per million as sodium chloride. Sulphates were abally representative analysis of the Cotton Valley formation.

Waters taken from the Reynolds Limestone formation contain somewhat higher total solids content. The sample analyzed from which I am reading indicates that there is something in the neighborhood of 341,000 parts per million of total solids; that the chloride content as sodium chloride was 296,000 parts per million, and that this formation also contains sulphates in the amount of 180 parts per million, and sulphides to the extent of 9.1 parts per million, iron, two parts per million, and aluminum, three parts per million.

Waters taken from the Travis Peak formation and analyzed at this particular time indicated that they ran in the neighborhood of 178,000 parts per million total solids, and 164,000 plus parts per million as sodium chloride. Sulphates were ab-

[illegible] 11

[illegible]

[illegible] maximum [illegible] present

[illegible].

Mr. [illegible], if fish were introduced into any of the water that you have described as coming from these three formations, could they live in that water?

A I do not believe that they would live in this water.

Q Can you tell us the relative production of oil and brine in this field?

A Yes. I would like to refer to the report of the Oil and Gas Commission; Factual Data Engineering Report of Oil and Gas Reservoirs Under State Control in 1955.

CHAIRMAN: Mr. Edelman, if you are referring to some published report which is not a memorandum of the witness' own making, I think you had better have that marked as an exhibit and have it identified.

MR. EDELMAN: Very well,

[illegible] I would like to introduce in [illegible] Commission as Government Exhibit No. 65, if there is no objection.

CHAIRMAN: Any objection?

MR. SMITH: No objection.

CHAIRMAN: Let it be introduced in evidence.

WITNESS: The portion which I shall describe to you represents the Pool Behavior Statistics of the Reynolds Limestone, and this indicates that in the year 1939 there were 301,291 barrels of oil taken from this particular formation in Village Field, and at that time there were 1,033 barrels of water produced. This is approximately a three hundred to one ratio.

Then, going on further, as the field matured, we find that in 1947 there were 1,224,226 barrels of oil produced, and 1,069,614 barrels of water produced; almost a one to one ratio.

[illegible] the production of [illegible] substantially increased, and [illegible] the production was 1,912,[illegible] barrels. Approximately, the ratio had now reversed. There were about six barrels of water for each barrel of oil.

The monthly production in December, 1955, indicates that there were 20,556 barrels of oil produced, and there were 172,500 barrels of water produced in the month of December, 1955, or a ratio of approximately eight and a half barrels of water to each barrel of oil.

MR. EDELMAN: Based on the statistics you have read us on the performance of the field, can you tell us whether in your opinion the ratio of the production of brine to oil will continue as you have indicated?

WITNESS: In my opinion, the water will continue to increase proportionately.

[illegible], [illegible] how the [illegible]

[illegible] ?

[illegible] the oil [illegible] from the wells [illegible], they are [illegible] above ground, and the waters are discharged, either into pits or into injection systems.

Q Can you tell us how an injection system operates?

A Well, it is fundamentally a means of returning the waters to the formations from which they originated, or to some other compatible formation.

Q That is underground?

A Underground.

Q And water so disposed of is not likely to return to the surface and pollute surface streams; is that correct?

A That is correct.

Q Now, can you describe how pits which are used for the retention of salt brines operate?

[illegible] the [illegible]

[illegible].

[illegible] located in the

[illegible]?

A Yes, I have.

Q Can you tell us something of the method in which those pits operate?

A The pits have been constructed by throwing up an embankment of earth, some of which have been compacted and some of which have not been. The brine flows into the pits and is held for a short time. According to my observations, the water usually finds its way out by several different methods, either by overflowing, breeching the embankments of the brine-holding ponds, or it might be mechanically syphoned out or drained out through pipes placed through the embankments.

Q Have you actually observed syphons or discharge pipes in pits in Village Field?

A Yes, I have.

Q Do you remember at what wells they were?

[illegible] No. 1

[illegible]

[illegible]

[illegible]

Q Can you [illegible] for the presence of th[illegible] other than to empty the pits of brine?

A No, I would see no reason for them being present other than to empty the pits of brine.

Q Have you observed seepage around pits in Village Field?

A Yes, I have observed seepage from these pits.

Q Have you made any studies of the soil of Village Field, or have you had them made, with respect to the suitability of Village Field as to the use of pits?

A Yes, at the request of the Public Health Service, an investigation of the soil of the pits was made.

Q I have a report here entitled "Seepage Investigation, Brine Storage Tanks, Village Oil Field, Columbia County, Arkansas, U.S. Department of Health, Education, and Welfare.

[illegible]

MR. EDELMAN: I ask to have that report marked for identification as Government Exhibit No. 56.

(Document so marked)

MR. EDELMAN: I show you Government Exhibit No. 56, and ask you whether that is the report which was made to you?

WITNESS: Yes, that is the report that was made to us.

MR. KEITH: Mr. Chairman, I am not familiar with these engineers. However, I assume that it is correct,and we make no objection.

CHAIRMAN: It will be received, then, subject to your right to examine it further, or make any further statements regard it you may wish. Otherwise, it is received subject to your statement.

MR. KEITH: Thank you, sir.

[illegible]

[illegible] Yes, sir,

familiar with its reputation.

Q Can you tell us what it is?

A They are considered quite experienced consultants in the field of soil mechanics and geology, specializing in soil works and foundation studies.

Q Now, can you tell us what the Government's exhibit which has just been introduced shows with respect to the characteristics of the soil in Village Field?

A I should like to read from the Conclusions of the report prepared by Mason and Johnson and Associates. Their Conclusion states: (reading) "Based on the results of the field, laboratory and office studies reported herein, it is concluded that seepage is occurring from the salt water reservoirs at each of the three sites selected as being [illegible] of the Village Field, and that the [illegible]

[illegible] the [illegible] of four cubic feet, thirty gallons per day per lineal foot of reservoir."

Q Have you observed in Village Field any reservoirs about one hundred by one hundred feet square, Mr. Krause?

A That would be the approximate size of reservoirs there; some larger; some smaller.

Q Can you tell us, based on this Report, what the seepage would be from a reservoir of that size?

A If there were four feet of head --- that is, hydrostatic elevation on the water, the difference between the inside and outside elevations -- the Report indicates that such a pit would allow approximately 12,000 gallons of water to escape daily.

Q Have you observed pits of that size with a four foot hydrostatic head in Village Field?

A Yes, I have.

[illegible]

[illegible]

of [illegible] and [illegible]?

Yes.

Can you tell us something of what those analyses show?

A The analyses show that the water has a very low pH value in comparison to that of the normal water, and that the ---

CHAIRMAN: Right there, may I interrupt and ask you to explain as well as you can, for the information of the Board and others interested, what engineers and chemists mean by that term "pH"; what does it indicate?

WITNESS: The pH is a measure of the hydrogen ion content of the liquid. That is, it is a measure of the acid reaction.

MR. EDELMAN: Mr. Krause, can you tell us what is considered a normal pH for water?

[illegible] A [illegible] pH [illegible]

[illegible]

In other words, above the higher figure you mentioned, they would be considered high, and below that figure, would be considered low?

A Normal pH is considered to be 7. Those above that are considered to be above normal ---- slightly above normal ---- and that below would be below normal.

Q Will you continue with your description? You had testified that the analyses showed a low pH value, as I recall.

Q Yes. I would like to refer to the analyses and material submitted this morning by the Geological Survey, and contained in Government Exhibit No. 47. The samples were taken from the Corney Creek at the crossing of Highway 15 and Corney Creek.

Q Will you identify the exhibit, please?

A Yes. I am now pointing to Government Exhibit No. 52. These analyses were taken at this [illegible] which is the highway

[illegible] the Louisiana border,
[illegible] some miles above the
Louisiana border. (Indicating)

CHAIRMAN: At Highway 15.

WITNESS: At Highway 15, in Arkansas. The analyses during the period February through September of 1956 indicated that the pH ranges were between approximately [illegible].2 and 5.6. At the same time, the chloride content varied between approximately 200 parts per million, and 7,000 parts per million.

The sampling station on Three Creeks, located where the highway, Arkansas No. 15, crosses Three Creeks, indicated that there was quite a lower concentration of chloride, and also a much improved pH value. The pHs on the crossing at Three Creeks were approximately 6 to 8.5.

MR. EDELMAN: Mr. Krause,

[illegible] that highway bri-

[illegible].

[illegible] the [illegible] Drain-

age [illegible] point and Louisiana?

A There is very little water entering the stream portion of either of these creeks between the point of sampling and the Louisiana-Arkansas State Line.

Q So these values could reasonably be expected to be found in the waters of those streams below the Louisiana border?

A In my opinion, they could be reasonably expected to be found in those waters below the Louisiana border.

Q Can you tell us, in pounds, or tons, the actual amount of chlorides passing the highway bridge on a day of representative flow?

A Yes, I believe I can. The computations work and the analyses and the discharge record are those of the United States Geological Survey, which I would like to cite.

Selecting a day in Feb-

[illegible], I would [illegible] the chloride concentration on [illegible] day was 1,830 parts per million. [illegible] the discharge and the concentration would indicate that 875 tons of chloride passed that particular point in a twenty-four hour period. Converted to sodium chloride, this would be in the neighborhood of slightly in excess of 1,400 tons in one twenty-four hour period.

CHAIRMAN: Mr. Krause, will you indicate that exact point to which that calculation applies? Is that the same one you referred to before?

WITNESS: This calculation applies to samples taken from Corney Creek on February 2, 1956.

CHAIRMAN: At that same intersection with Arkansas Highway 15?

WITNESS: At that same intersection with Highway 15.

[illegible]: Dr. [illegible], do you [illegible] chlorides [illegible] that flow? Do they continue to retain their identity?

WITNESS: Chlorides will remain in the water permanently unless diminished by dilution.

Q In other words, one would expect to find that substantially that tonnage of chloride could be found in the waters of the Corney Drainage System down to the confluence with the Ouachita River?

A Yes.

Q Do you know any source for chloride pollution, and the other indications of pollution that you have indicated in your testimony, other than the production of brine from wells in the oil fields in the Corney Drainage System?

A No, I do not.

Q May I ask you this: Do you attribute the presence of chloride in these waters to the operating wells in Village Field which dis-

[illegible]

[illegible]

[illegible] one in [illegible]ville and one in [illegible]?

Yes, that is right.

CHAIRMAN: Which map are you referring to now?

WITNESS: I am referring to Government Exhibit No. 53.

MR. EDELMAN: Mr. Krause, are you familiar with the waters of this area in their natural condition?

WITNESS: Yes, I have observed the tributary creeks above the points of the pollution.

Q Will you compare those waters in their natural state to the waters of Corney Creek below the oil fields with respect to chloride content and pH?

A Yes. I would like to refer to our report indicating the values of analyses made in these [illegible] tion.

[illegible]

[illegible] that was marked [illegible]?

MR. EDELMAN: It has not yet been introduced, Mr. Wilson.

CHAIRMAN: Well, then you had better follow the same procedure with that and have it marked.

MR. EDELMAN: I ask to have that marked as an exhibit for identification for the Government, Exhibit No. 57.

CHAIRMAN: Will you identify it and then submit it to Counsel?

MR. EDELMAN: Will you read the title that is on the cover page of that document?

WITNESS: Yes. This document is entitled "Biological Studies in the Corney Drainage Area, March, 1956. Prepared by the Department of Health, Education, and Welfare, Public Health Service, Region 7, [illegible], [illegible]."

[illegible] Will you [illegible] with the [illegible] inspection.

([illegible])

MR. [illegible]: No objection.

MR. EDELMAN: Without objection, I ask that it be marked in evidence as Government Exhibit No. 57.

CHAIRMAN: It will be received.

WITNESS: Reading from the Table entitled "Chemical Characteristics of Water Samples from Corney Drainage Area Collected September 21 through 24, 1954", we find the following analysis of samples taken from Harper's Creek, and I should like to point out the approximate place of sampling. (Indicating) The approximate points are on Government Exhibit No. 53.

CHAIRMAN: Will you do that, when you point to each map.

WITNESS: At approximately

[illegible]

[illegible] indicati [illegible]. The pH value at that point was 6.7; the methyl orange alkalinity was [illegible], and the chloride content was twenty parts per million.

Q Can you describe the color of that water?

A The water has a slightly brownish coloration during times of low turbidity and during times of considerable surface run off, the water has a definite turbidity.

Q Can you tell us what happens to water with that color and turbidity after the brines from the oil fields hit it?

A Yes. The water immediately becomes crystal clear, having, as far as can be observed, no color, and very little, if any, turbidity.

Q Is that characteristic of the entrance of chlorides into water of that character?

A Yes, I would say that this is characteristic [illegible] which [illegible] of Corney Creek [illegible] the safety of fish and [illegible] in them is concerned?

A Would you mind restating your question, Mr. Edelman?

Q Can you tell us whether fish would be better off in the unpolluted water than in Corney Creek below the Village Field?

A Yes, indeed.

Q Do you consider the waters of Corney Creek favorable or unfavorable for fish life?

A I would consider the waters below the points of pollution definitely unfavorable.

Q Do you mean it would kill them?

A In my opinion, it would kill them.

Q Now, Mr. Krause, based on the chloride, pH and other values you have given for these waters, can you tell us whether in your opinion the waters of Corney Creek as they reach Louis-

[illegible], [illegible] [illegible], are suitable for in-
[illegible]

A I [illegible] [illegible] that in their present [illegible] [illegible] [illegible] industry [illegible] [illegible] for.

Q In other words, they are not suitable for many industries?

A Yes. I would consider them unsuitable for many industries.

Q Can you tell us why they would be unsuitable?

A The waters are highly corrosive, and the presence of chloride would interfere in all probability with certain processing that is carried on in connection with manufacturing of materials.

Q I show you Government Exhibit No. 51, and ask you whether this is typical of the kind of corrosion that would occur? (Indicating)

A Yes, that is typical of the corrosion that occurs.

Q If the waters of Corney Creek in Louisiana,

[illegible]

[illegible] for indus-

trial?

A [illegible] quite satisfactory for many industrial uses.

MR. [illegible]: The Government has no further questions.

CROSS-EXAMINATION

BY MR. KEITH:

Q I believe that you have stated that the seepage from the average salt water pit in the Village Field is approximately 12,000 gallons per day per pit; is that correct, Mr. Krause?

A That would be under certain circumstances.

Q That is more or less an average, is it not?

A Yes. I am basing that on the Conclusions reached by the firm of Mason and Johnson.

Q Are you familiar with the daily average production of salt water from the wells in [illegible], that would [illegible] hundred and ten or two hundred and fifteen barrels per day, would it not; a fifty-five gallon barrel?

A Do you normally consider a fifty-five gallon barrel as an oil barrel?

Q Yes.

A It is slightly in excess of two hundred barrels.

Q Then if a well is producing only two hundred barrels of salt water per day, there would be no water left in the pit; is that correct?

A I believe that if you will examine what I stated, that this would escape under certain conditions of hydrostatic head.

Q Well, do you know where those conditions exist?

A Yes, I have seen conditions where that

[illegible]

[illegible] have a seepage of approximately two hundred to two hundred and ten barrels per day per pit?

A According to the Conclusions reached, we would have a substantial amount of water escaping from these pits.

Q Then, again, a well producing two hundred barrels of salt water per day turned into a pit, all of the salt water would seep out; is that correct?

A No, that is not substantially correct. The seepage would increase as the head increased in the pond.

Q Did you observe any pits that were filled with water?

A Yes, I did observe one pit that was within a few inches of overflowing.

Q Then it was not all seeping out?

A That is true.

[illegible] with respect to the susceptibility of the Travis Peak, [illegible] and the [illegible] Lime to an [illegible] system?

A No, I have not made any study of the susceptibility of those formations.

Q Would you please explain to the Commission whether or not all formations are susceptible to a successful reinjection program?

A I can only report hearsay in that respect, and that is to the effect that waters from certain formations may not be compatible with waters from other formations.

Q Well, if your break down pressure was as much, say, as 3500 pounds per square inch in a given formation, would that be susceptible to a successful reinjection or disposal system?

A I have heard of instances where pressures higher than those mentioned have been utilized.

[illegible] on your own personal knowledge

MR. KEITH: That is all.

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BY MR. EDELMAN:

Q Mr. Krause, is there an injection system operating in Village Field?

A Yes, there is.

Q Is there more than one?

A In Village Field?

Q Yes?

A Yes.

Q Can you tell us in what formations those injection systems operate?

A I cannot tell you at this moment.

MR. KEITH: We will admit that there are three systems in the Village Field.

MR. EDELMAN: The Government has no further questions.

CHAIRMAN: Any further

[illegible], Jr.

THE CHAIRMAN: Do any other [illegible] questions of this witness? Any [illegible] of the [illegible]? I would like to ask Mr. [illegible] just a question or two.

EXAMINATION

BY THE CHAIRMAN:

Q Regarding the manner in which these ingredients in the water affect the fish, does the chloride act on the fish, if you know, as a direct poison, or in some other way; how does it affect them?

A I am sorry, sir, I don't believe that I am able to answer that. I think you will find that this is in the field of biology, and that my colleague will be able to give you a better answer than I could.

Q Then you would rather refer that question to a biologist?

A Yes, I would.

Q Now, referring to your testimony regarding the [illegible] characteristic of this water [illegible] [illegible] [illegible] pH characteristic [illegible] quality for industrial use, and in what way?

A Yes. The pH affects the industrial use in being highly corrosive.

Q Which figures within the range that you have stated? You stated that an average pH was seven?

A Those below seven, and the reaction would be increasingly great as they go downward.

Q Do you mean, then, that water with a pH of seven would be satisfactory?

A Yes, for most uses.

Q And, then, if it is below that, then that impairs the quality; is that right?

A Yes, it impairs the quality.

Q And what about it if it gets higher?

A Within the realm of up to approximately pH of nine, it would be satisfactory for most [illegible] it [illegible] of nine; however, [illegible] purposes, [illegible] can be utilized. But when it is below the figure which you have stated as average, or normal -- and that would be, as I understand it, below somewhere around six, or something of that order?

A Yes, I would say below six definitely it would have effect.

Q Then you have the corrosive effect?

A Yes.

CHAIRMAN: Any other questions? That is all.

(Witness excused)

MR. STEIN: If it please the Chair, we should like to interrupt the presentation of the Government's case at this time and call Dr. Wolf of Haynesville, a Government witness, out of order, since Dr.

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[illegible]

[illegible], for the testimony of this witness.

CLERK OF COURT: Do you [illegible] that the testimony you are about to give will be the truth, the whole truth, and nothing but the truth, so help you God?

WITNESS: I do.

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DR. C. O. WOLF

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STAFFORD:

Q Doctor, will you state your name and approximately how long you have lived and practiced in this area, please?

A My name is Dr. C. O. Wolf of Haynesville,

[illegible]

[illegible]

[illegible] you have to [illegible] give us a [illegible] you may give that statement, and then make any other remarks that you have, and then there may be some cross-examination.

A I will read that statement: (Reading) Since 1933, I have lived approximately thirty miles from Corney Lake. Fishing is my recreation. I have been fishing in Corney Lake since the dam was first put in, approximately in 1938. It was good fishing and ideal for recreation until the past four or five years. During that time, there have been many fish-kills. I have seen dead fish all over the lake. I have seen the water change from its normal murky color until it has become so clear that you can read print ten feet down in the water. The algae and food for fish [illegible] of the water [illegible] place [illegible] are very [illegible] in the chan- [illegible] corro- sive. I [illegible] still fishing in Corney Lake, and catch some fish, but not like I did b fore the normal character of the water was changed by the discharges from the oil fields. Apparently there is a lack of food, not only for fish, but also for ducks. I had a duck blind on this lake, but hunting is not as good as it formerly was. Migratory fowl light on the lake, but do not stay there to feed. Formerly during the season there was usually always lots of mallards and black jacks on the lake. This area of Louisiana lacks recreation areas and needs the Corney Creek and Corney Lake waters restored to their former normal condition for recreational

[illegible]

Wolf, [illegible] that you could [illegible] to your statement in connection with the recreational use of the Corney Creek and Corney Lake area?

WITNESS: I believe not.

MR. STAFFORD: Then we will turn him over for cross-examination.

CHAIRMAN: Any cross-examination?

MR. KEITH: No cross-examination, Mr.Chairman.

CHAIRMAN: Any members of the Board? That is all, Doctor Wolf. (Witness excused)

MR. STEIN: If it please the Chair, Mr. Edelman will resume with the Government's case.

CHAIRMAN: Mr. Edelman.

MR. EDELMAN: Mr. Anderson.

[illegible] you solemn-

[illegible] you are about

[illegible] will be the truth,

the whole truth, and nothing but the truth,

so help you God?

WITNESS: I do.

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JOSEPH B. ANDERSON

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY: MR. EDELMAN:

Q Mr. Anderson, will you identify yourself for the record?

A My name is Joseph B. Anderson. I am Regional Biologist for the Public Health Service, Dallas, Texas, Region 7.

Q Can you tell us in what field your training has been?

[illegible]

[illegible] that is what you are [illegible]

MR. [illegible]: Mr. Anderson is an expert biologist and we will agree to that.

MR. KEITH: We will so admit.

MR. EDELMAN: Mr. Anderson, are you familiar with the oil fields in this area; that is, Schuler, Pine Tree, Atlanta, Spotsville, Magnolia and Village Fields?

WITNESS: Yes, I am.

Q Have you made inspections of the producing wells in these fields from time to time?

A Yes, I have made several inspections.

Q When did you make your first inspection?

A The first inspection was in September of 1953.

Q Can you tell us the occasion for that inspection?

[illegible] of

[illegible] in [illegible] with [illegible].

Q [illegible] inspections since 195[illegible]?

A Yes, I have made a number of inspections since 19[illegible].

Q What is your most recent inspection?

A I have been in the fields in December of 1956 and January of 1957.

Q Were your inspections subsequent to June 9, 1954 made to determine the compliance of producing wells in these fields with the Surgeon General's Notice and Findings of that date?

A Yes.

Q Can you tell us in general what your inspections disclosed with respect to the wells that were listed in the Surgeon General's Findings of June 9, 1954?

A Following the Surgeon General's Notice in 1954, inspections were made of the oil

[illegible]

[illegible] of these had cleaned up to a satisfactory degree, either by injecting the brines, by shutting off the production of brine, or, in some cases, by closing the well down.

Q Now, you said there had been considerable clean up. Was Schuler Field, as you call it, cleaned up?

A An excellent job had been done in Schuler Field.

Q Was Atlanta cleaned up?

A There had been some progress. However, it was not cleaned up.

Q What about Village Field?

A Village Field had considerable pollution that was being discharged to the streams.

Q Mr. Anderson, the Surgeon General's Notice of hearing, which was read earlier this morning, and the maps behind you, indicate [illegible] it is contended [illegible]

[illegible] did you inspect these eighteen [illegible]

A Yes.

Q Can you give us the results of your inspection with respect to each of these wells, Mr. Anderson?

A Yes.

Q Please do so. And when you use any of the maps, will you please identify it by exhibit number?

A As I understand it, you would like the history of the inspections from ----

Q Yes, with the Board's permission, I would like to have the Findings that you made on your inspections of these wells.

A The McAlester Fuel Company J. G. Alexander Estate B-1 --- (Indicating)

CHAIRMAN: Mr. Anderson, just state which exhibit number is on the map that you are pointing to.

[illegible] Govern- [illegible] The [illegible] B-1 was [illegible]

In 1953, there was a small pit in which it was observed that brine was being discharged. In 1954, a new pit had been built, and the brine was being discharged into that pit. In December of 1954, it appeared that this pit was of inadequate size to contain the brine. In April of 1956, there were definite signs of seepage from this pit. In December of 1956, this pit was observed leaking.

The next lease, Williams, Sellars and Ewing, J. G. Alexander No. 1, was first observed in September of 1953. Brine was observed being discharged to the surface. A new pit had been constructed by October of 1954, and the brine was being discharged. The pit was observed to be rapidly filling up in December of 1954.

[illegible] was noted from [illegible] not producing any brine. It had been temporarily shut down. In [illegible] 1956, considerable volume of brine was being produced and discharged to the pit, and there was considerable seepage from it.

The McAlester Fuel Company Haskell A-1. Brine was being discharged to the surface in 1953. It was noted in October of 1954 that the pit wall had been breached and the production was flowing to the stream. In January of 1956, brine was observed to be flowing from this pit through a breach in the wall. In September of 1956, this well was not producing brine, and the pit was in the same condition.

The Bradham and Ragsdale Machen Nos. 1 and 3 discharge to a common pit. In 1953, September, the brine [illegible] constructed [illegible]. The brine was still [illegible] the [illegible] surface. In September of 1955, the pit appeared to be inadequate, due to excessive seepage. It was observed again in January of 1956 to have considerable seepage, and again in September of 1956.

The Bradham - E. D. Harris No. 1. In 1953, brine was observed leaking from a small pit. A new pit was constructed, and in December of 1954 it had not yet been put into use. It was also observed that very little brine was produced at this lease. In September of 1955, the pit appeared to be inadequate to hold the discharge of brine. Subsequent to that time, in January of 1956, there was very little discharge from this well; there was about a foot of brine in the pit; and there appeared to be some seepage. In September of 1956, very [illegible] pit.

[illegible] This well discharged brine to the surface in September of 1953. A pit was constructed, and it was observed in October of 1954 that the brine was still being discharged to the surface. By March, 1955, the brine was being discharged into the pit, and in September of 1955 the pit appeared to be inadequate, due to excessive seepage. It was also observed to be seeping brine in January of 1956, in September of 1956, and in January of 1957.

Bradham - Tissue No. 1. This well produced brine which discharged into a small inadequate pit in September of 1953. The same condition existed in October of 1954. A new pit was constructed shortly thereafter, but in September of 1955, the pit appeared to be inadequate, due to discharge through a pipe. Subsequent inspections, in December, 1955, in April of 1956, [illegible] the [illegible]. [illegible] - [illegible] [illegible], [illegible], brine [illegible] this lease. A new pit was provided by December of 1954. The pit appeared to be inadequate in June of 1955, due partly to seepage and partly to indications that the brine was being syphoned from the pit. September of 1956, there was seepage from the pit, and there was some evidence of the pit being discharged periodically.

The Bradham - Booth No. 2: In September of 1953, a fairly small quantity of brine was being discharged to a small pit. By October of 1954, it was observed that a small amount of brine was being produced and discharged to the pit. A new pit had been constructed by December of 1955, and by January of 1956, seepage was evident from this pit. The same condition was noted in April of 1956, and September

[illegible]

[illegible] No. 1: In [illegible] of 1954, brine was [illegible] pit. In December of 1955, a pit had been constructed; very little water was being produced at that time. By April of 1956, it was determined that approximately two gallons a minute were being discharged to the pit, and it was beginning to fill somewhat. In September of 1956, there was a small amount of brine being discharged to the pit.

Next, Bradham and Ragsdale-Threadgill No. 1: This lease was observed in October of 1954. The brine was being discharged to the surface. By January of 1956, there was a flow through the pit wall which was estimated to equal the in-flow of brine to the pit. It was determined in April of 1956 that the pit appeared to be unsatisfactory, due to the stream of water which flowed from this pit to the stream. In September of [illegible] another pit had [illegible] pit, [illegible] the brine in the pit at that time [illegible].

The Bradham and Ragsdale-Threadgill No. 4: In 1953, brine was being discharged to the surface of the ground. In October of 1954, the well was not operating, but in December of 1954 it was in operation, and there was some water produced. In January of 1956, a considerable amount of brine was observed to be flowing from this pit. This well has a common pit with Threadgill No. 1.

Bradham and Ragsdale - A.A. Gunnels No. 1: Brine was observed being discharged to the surface in September of 1953, and in October of 1954. A new pit had been constructed by that time. In September of 1955, it was determined that the pit was inadequate, due to excessive seepage from it. The same unsatisfactory [illegible] in April [illegible] 1956 [illegible]

The Bradham and Ragsdale-J. J. Gunnels No. 1: Brine was observed being discharged to the surface in 1953 and in 1954. A new pit was provided, and observations in September of 1955, January of 1956, and September of 1956 indicated that there was considerable seepage from the pit.

The Bradham - J. J. Gunnels No. 2: Brine was being discharged to the surface in 1953, and in October of 1954. It was determined in September of 1955 that this pit was inadequate, due to seepage. It was also observed in January of 1956, in April of 1956, and September of 1956, and there was seepage from this pit on those dates.

McAlester Fuel Company - T. O. Giles Estate A-1, which is located in the Spotsville Field. A pit was construct-

[illegible] which [illegible] of 1953, and in [illegible] of 1954 the same condition existed. In February of 1955, it was noted that injection had been provided at this lease, the brine being injected between the casing and the tubing. However, in September of 1955, it was no longer in operation, and discharges through the pit to the surface were noted in January of 1956, in April of 1956, and September of 1956.

The Bradham-Longino-Talley No. 1X, which is located in the Atlanta Field, was observed in September of 1953, and in November of 1954, and at those times brine was being discharged to the surface. A pit had been provided by March of 1955. Subsequent investigations in September of 1955, in April of 1956, and September of 1956 indicated that the pit was not holding the brine, and that it was [illegible] Do you have

[illegible] this witness?

[illegible]: Yes, Mr.

Chairman.

CHAIRMAN: We will now take a recess for fifteen minutes.

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RECESS

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CHAIRMAN: The hearing [illegible] and a con[illegible] [illegible], as we draw [illegible] session, [illegible] to adjourn at five o'clock, it appears that we may need more time, the Members of the Board would be agreeable to holding an evening session, if that is satisfactory to the parties and their counsel.

So, if counsel, or the other parties not represented by counsel, will be considering that as we go along the rest of the afternoon, and let us know sometime before five o'clock whether you want an evening session or not, the Board will be willing to allow that.

I understand from Government counsel that there were some others who want to be called out of order, who need to get away; is that right, Mr. Stein?

MR. STEIN: That is correct, Mr. Wilson.

CHAIRMAN: You may proceed

[illegible] Mr.

[illegible] of the

[illegible].

MR. STAFFORD: Will Dr. Marvin Green come forward, and will Dr. Ragon Green come up near the front, where he can follow him, please.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the whole truth, and nothing but the truth, so help you God?

WITNESS: I do.

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DR. MARVIN GREEN

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STAFFORD:

[illegible]

[illegible] you have been a [illegible]

MR. [illegible]: We will admit the Doctor's qualifications, sir.

MR. STAFFORD: Well, I want to qualify him also as a fisherman. Do you ---

MR. KEITH: We will admit that he is an excellent fisherman. (Laughter)

MR. STAFFORD: In that event, Doctor, in the interest of time, you gave us a statement. Will you read that statement, if you have a copy, and then make any other remarks that you want. But first I would like for you to identify on the map over there marked as Government Exhibit No. 50 --- the far map on the right --- Exhibit No. 50, approximately where the place you will talk about is located on the D'Arbonne ---

(Witness complies)

CHAIRMAN: [illegible]

[illegible]

WITNESS: My camp is at [illegible] Landing";

[illegible].

CHAIRMAN: What township is it?

WITNESS: Township ---

CHAIRMAN: Maybe one of the engineers can help you identify that.

MR. STAFFORD: In terms of straight miles, Doctor, approximately how far is your camp below Corney Lake?

WITNESS: I am half way between Bernice and Farmerville. So this is approximately twenty miles down stream from Corney Lake.

Q Now, Doctor, if you will, read your statement, and then if there are some other observations about the physical facts of that section, we will be glad to have them.

A (Reading) I have fished Corney stream

[illegible] was built [illegible] for our use [illegible], and this is our outlet for recreation. As I stated on this map, this is about half way between Farmerville and Bernice, at the point known as Ferris Landing. This has been the prize fishing area of all this part of the country. It is a beautiful area, and a very delightful bass fishing stream. This is about our only outlet for recreation.

We built this camp about 1952, or early 1953, the last good fishing year we had, and we have had no more fishing since, so we have had no benefit from it.

At this area, the last good fishing year we had was in the spring of 1953. As soon as the high waters reced-

[illegible] I have [illegible] [illegible] a very few [illegible].

Another thing that I have noted that has happened, when we fish this water, the hooks on our lures rust from corrosion, and this never happened before when we fished this stream, in years past.

MR. STAFFORD: Before approximately what year, or time?

WITNESS: Since 1953. Another thing we have noted about this stream, during the heyday of fishing in this stream, this water had a very characteristic color that was produced by the microscopic life in the water, and this does not exist now. This water is as clear as tap water, and the creek is visible down through the water for four to six feet, and, consequently, something [illegible] the food supply [illegible], the [illegible] there,

and our [illegible] is ruined.

MR. [illegible]: Doctor, if there are no other comments, I will ask if there is any cross-examination?

CHAIRMAN: Any cross-examination?

MR. KEITH: No cross-examination, sir.

CHAIRMAN: Any members of the Board? Doctor, getting back to the location of the point of your camp, how far is that above the U. S. Forest Service Recreational Project on Corney Lake?

WITNESS: Oh, I am downstream from that.

CHAIRMAN: Oh, you are downstream from that Project?

WITNESS: I am downstream from it.

CHAIRMAN: Well, then,

[illegible] below the boundary of that project [illegible]

WITNESS: Approximately twenty miles. That's a rough estimate.

CHAIRMAN: Any further questions?

CROSS-EXAMINATION

BY MR. KEITH:

Q Does the Ouachita River flow into Corney Creek above or below your camp, Doctor?

A No, Corney Creek flows into D'Arbonne Bayou, and D'Arbonne flows into Ouachita River, on down -- (Indicating)

Q Below your camp?

A On downstream from it.

MR. KEITH: That is all.

CHAIRMAN: Are there any sizable tributaries that flow into Corney Creek between Corney Lake and your camp?

WITNESS: No; only small streams; very small streams.

[illegible]: Do [illegible]

[illegible]

[illegible]: That is known [illegible] main stream, between [illegible] camp, and, as I recall, that is about the only stream that flows in. Now, Little Corney comes in down by El Dorado.

CHAIRMAN: But where does the main flow of Corney Creek come from that flows past your camp?

WITNESS: It is a continuation of the stream that has the dam on it that forms Corney Lake.

CHAIRMAN: That is all.

MR. STAFFORD: That is all, Doctor.

(Witness excused)

MR. STAFFORD: Call Doctor Ragon Green.

CLERK OF COURT: Do you solemnly swear that the testimony you are about to give in this matter will be the truth, the

[illegible]

[illegible]

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DR. RAGON GREEN

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STAFFORD:

Q You are Doctor Ragon Green?

A Yes.

Q You have still a third brother, is he here today?

A Yes, he is here; Dr. Felton Green.

Q Would you mind having him also come forward, and after you, we will just have him sworn, and then he can add anything that may differ from the other testimony. -- You are Doctor Ragon Green, and you also practice in Ruston?

[illegible] [illegible], and indicate any other [illegible] which you may want to add.

Yes, my experience has been the same as his. And I would like to add one thing: You know we are planning very greatly on building a big lake down further, called Lake D'Arbonne, and Corney Creek, Corney Bayou, Corney Creek and its tributaries, form a great part of the water supply that will furnish water to this lake, and if we can't get our creek straightened up, I don't know of any particular reason why we should go to the expense of building our lake.

Q Doctor, if you will look at the map which we have identified as Government Exhibit 50---- it is the last map --- Government Exhibit No. 50 -- will you indicate the area of the proposed Lake D'Arbonne, and then point out the location of your camp in that relation?

[illegible] D'Arbonne [illegible] (Indicating) [illegible] be [illegible] at the upper end of the water that is dammed back into Corney Creek; our camp will be just about at the upper end of where the water is dammed back as part of the proposed D'Arbonne Lake. (Indicating)

Q The water area there, outlined in blue, is the portion that would be under water in the proposed Lake D'Arbonne?

A From what I gather from the engineers, yes.

MR. STAFFORD: I believe that is all, Doctor, unless you have some other statements you wish to make about this.

WITNESS: I might like to add one thing. I think that possibly the testimony that I have given is somewhat self-

[illegible] he is and [illegible] people such as I think [illegible] of several individuals [illegible] it has hurt in their method of making their living. I also know that a bunch of these men made a considerable amount of money for them commercial fishing, and that is a thing of the past.

MR. STAFFORD: Doctor, if you will pause a moment, mav I ask you if you know C. E. (Bo) Kay, Marvin Roach and Ellis Lowery, or any one of them?

WITNESS: Yes, sir. Bo Kay and I were grammar school kids together, and he has taken care of our camp to a great extent, and he and his sons and Mr. Roach and Mr. Lowery have been people that have paddled boats for us, and have done commercial fishing.

MR. STAFFORD: Mr.Chairman, I would like to ask your indulgence to [illegible] years, I [illegible] for [illegible] boats and [illegible] people such as I when we [illegible] fishing, and I know of several individuals whom it has hurt in their method of making their living. I also know that a bunch of these men made a considerable amount of money for them commercial fishing, and that is a thing of the past.

MR. STAFFORD: Doctor, if you will pause a moment, may I ask you if you know C. E. (Bo) Kay, Marvin Roach and Ellis Lowery, or any one of them?

WITNESS: Yes, sir. Bo Kay and I were grammar school kids together, and he has taken care of our camp to a great extent, and he and his sons and Mr. Roach and Mr. Lowery have been people that have paddled boats for us, and have done commercial fishing.

MR. STAFFORD: Mr. Chairman, I would like to ask your indulgence to

[illegible]

[illegible] and

[illegible], but I have

sworn [illegible]; I wonder if the Doctor could just attach those, since he has identified these men, as a part of what he offers at this time? I know they can't be cross-examined, but I would like to have them---

CHAIRMAN: Well, of course unsworn statements do not have the ----

MR. STAFFORD: These are sworn statements.

CHAIRMAN: Well, I suppose that in order to conform with the regulations, to be strictly receivable as evidence, the statements would have to be sworn to by the witnesses in person, and testified to here at the hearing, but we have already received a number of unsworn statements, and the Board will receive them, subject to any objections

[illegible]

[illegible] entitled to.

[illegible] proceed with [illegible], I want to inquire if there is any cross-examination of this witness?

MR. KEITH: No cross-examination of this witness, and if we can see these statements, we will probably admit that if these persons were present, they would testify to the contents of these statements.

CHAIRMAN: Well, that will simplify the case as to your clients, Mr. Keith, but not as to other interested parties. Such an admission, of course, would not be binding on any party not here appearing in person or by counsel.

MR. KEITH: Yes, sir; we are speaking only for the parties whom we represent.

CHAIRMAN: Just a moment. Let me see if there are any members of the Board

Can you give me some idea about the size of the operation of this boat rental; how long it went on, and how many people were engaged in it, or how many boats that were being rented and used for recreation on these waters?

A Mr. Kay, at my last knowledge, had five boats that he rented at that time.

Q What was his name?

A Kay. K-a-y.

Q At what time was that?

A The last time I fished the stream was last March, I believe; sometime last spring, let's say, and at that time, he had five boats for rental. I would have to admit they were in pretty bad shape.

Q How long before had he carried on that business?

[illegible]

[illegible] I haven't been [illegible], I don't know.

Q Well, how have these conditions that you describe affected his business?

A Well, he has no fishermen any more, Mr. Chairman. I doubt very much if he even rents a boat at all, unless somebody wants to go frog-hunting, or something, maybe.

Q And were there any others in the boat rental business?

A Yes. Mr. Roach had boats at another landing just above this, that he rented boats from, and he also used them to carry people that got him to paddle the boat while they were fishing.

Q Do you think of any others?

A Mr. Lowery had two boats that he rented; one he used himself, and the other one he rented out. And then up and down the stream [illegible] in [illegible] fish.

Can you tell us a little more about what this commercial fishing industry amounted to; what kind of fish did they catch, and how many were engaged in it?

Right at this area that we were in, there were two men engaged in it; Mr. Ferris and Mr. Lowery primarily. Most of the fish they caught were buffalo and catfish. The volume of it, Mr. Chairman, I can't say, because I have never inquired into it.

Q And over what period did that industry operate?

A Well, Mr. Chairman, I have been going up there since I was six years old, and I can never remember a time when there weren't nets from these commercial fishermen along the stream; in the stream.

Q What type of nets?

[illegible] They were [illegible] [illegible]. [illegible]) [illegible], [illegible] to know the [illegible] and some authorities. (Laughter)

A I don't know the name of the nets. They were wire nets; most all of them were wire nets that they put in in the stream.

Q Were they some form of a trap net of some kind, or were they gill nets?

A They were trap nets; the trap net is with the part that goes down, and the fish comes in and can't get back out; I think that's what you mean by that?

Q Yes. And you say their principal catch was buffalo and catfish?

A That's right.

Q And how long did you say that industry operated?

A Well, I've known of it since I was a little boy.

[illegible] on the

[illegible]

A This past spring. Now, I don't know whether they have caught anything or not, Your Honor.

Q Were they still trying up until last spring?

A Let's say their nets were still in the stream.

Q You don't know what they were still catching?

A No, I don't know.

CHAIRMAN: Any other questions?

RE-DIRECT EXAMINATION

BY MR. STAFFORD:

Q Doctor, you know that when you describe a person as "a commercial fisherman" with reference to whether or not you understand

[illegible]

A [illegible] I guess a fellow who [illegible], he probably is classified as a commercial fisherman.

Q Do you know whether or not the State requires a license for that?

A I do not know. I have never done it.

MR. STAFFORD: All right; I believe that is all, Mr. Chairman, and I would like to have his brother on the stand.

CHAIRMAN: That is all, Doctor.

(Witness excused)

CLERK OF COURT: Do you solemnly swear that the evidence you are about to give in this matter will be the truth, the whole truth, and nothing but the truth, so help you God?

WITNESS: I do.

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[illegible] for the Govern-

ment, having been first duly sworn, was examin-

ed and testified as follows:

DIRECT EXAMINATION

BY MR. STAFFORD:

Q Dr. Green, will you identify yourself so as to distinguish yourself from your brothers? I do not have your first name.

A I am Doctor Felton Green of Ruston.

Q You have heard the testimony of your brothers; have you something to add, or do you want to ---

A I think it has been covered fairly well. I have been fishing up there since I was six or eight years old, and I have caught a lot of fish in Corney, and I still love to fish, but there is not anything up there to catch any more.

Q Doctor, do you know what is required of a

[illegible]

[illegible] commercial fishermen.

MR. STAFFORD: I hope that gets them out from under the Game Warden. (Laughter) I will turn you over, then, for cross-examination. Mr. Chairman, I have no further questions.

CHAIRMAN: Any questions?

MR. KEITH: No questions, Mr. Chairman.

CHAIRMAN: Any of the Board? That is all, Doctor.

(Witness excused)

MR. STAFFORD: Mr. Chairman, we have Dr. Fowler here, who is not a medical doctor, but a Ph. D. from the College at Ruston, and we are afraid that we will miss him if we don't introduce him at this time. Doctor Fowler.

[illegible] sol- [illegible] the [illegible] nothing but [illegible], so help you [illegible]

WITNESS: I do.

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DR. J. R. FOWLER

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called as a witness by counsel for the Government, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STAFFORD:

Q Doctor Fowler, will you identify yourself by your title, initials, your employment, and your special field of study?

A I am J. R. Fowler, Professor of Zoology at Louisiana Polytechnic Institute. My special training in the field of Zoology is in the field

[illegible]

[illegible] upon [illegible]

Doctor [illegible], you prepared a statement. I seem to have misplaced my copy. Do you have a copy there with you, or will you relate to the Board the substance of what you told us, and add any other remarks concerning how long you have been familiar with the Corney Creek Drainage Area, fishing in it, and anything that your studies have shown you about the condition of these waters, and any effect that you have noticed during the period that the oil fields in Arkansas have increased in production, and apparently there have been substances coming into this drainage system from that area?

A With respect to the length of time that I have been fishing this stream, I would like to say that my father's farm and the [illegible] that I [illegible]. I have [illegible] all the way from [illegible] through the Corney Lake, and [illegible] distance occasionally above the lake. I would like to corroborate the statements which the Doctors Green have made with respect to the ----

Q I have located this statement. In the interest of time, would you mind identifying it as the statement that you gave us, and read it, if you like, and then add any other statements that you care to.

A This is the statement which I made before this Committee day before yesterday, and it reads: (Reading) I have fished Corney since a small child, and then as a young man, and until I moved to Baton Rouge, at which place I lived for some [illegible] in [illegible] [illegible], [illegible] many others in [illegible], since that time, up until C[illegible] Creek became worthless to fish. Conney Lake was a wonderful fishing stream, and lake, up till about four or six years ago. I continued to fish it until it became so clear, and fishing was so poor, that it did not justify fishing it further.

Back ten or fifteen years ago, that lake had dozens of boats. The color of the water at that time was of a greenish-tannish color. The water was filled with microscopic plants and animal life. With the coming of the pollution into it, the pollution was sufficient to destroy these small plant and animal life to the extent that it did not furnish the basic food material for fish to feed upon --- not for fish to [illegible] upon, but the smaller organisms to feed upon, which, in turn, grew to the size that fish could feed upon them.

With the coming of the pollution, this removed the food material; as a consequence, the food wasn't there for the fish to feed upon, and they therefore, are not present now.

I have analyzed the lake, have tasted the water many times, and you can actually taste the salt in the water.

I have studied the lake with the class in Game Management, starting some ten years ago, and have tested it or checked it each year up to the present time. We usually start at the upper end of the lake, and pass around to the west side, where we get boats, and go out into the lake for our studies.

Up until about the

[illegible] polluted, with [illegible] this [illegible] stream in North Louisiana. I have personally gone to the stream in the afternoon to fish for bass, and within an hour or two catch the limit of from fifteen to twenty bass. I have fished the stream a few times this year, and last year, and have not been able to catch more than two or three small ones in an afternoon's work.

There used to be dozens of boats for rent, scattered along the stream between D'Arbonne and Corney Lake, which you could have for renting.

Fish quit spawning when the pH of the water reaches a low of around 5 to 6. Normal pH is 7. Fish and Wildlife Commission has stated that they keep check on this. Low pH stops fish from spawning beginning about 6, depending upon which species you are dealing with.

[illegible]

I have written in, since this statement was typed, a table of the ranges of pH, and this comes from statements which I took in classes under Professor Swingle at the Alabama Polytechnic Institute at Auburn, Alabama, while taking courses in Fishery.

A salt concentration of .5% (which would be five parts per thousand, or five thousand parts per million) will stop the spawning of the game fishes. A pH of 6 slows it down markedly, 5 stops it, in the game group of fishes; and between 4.5 and 4, kills result with respect to the game fishes.

In my opinion, it might not be wise to build Lake D'Arbonne unless we can greatly reduce the pollution in Corney Bayou. Approximately fifty [illegible] of this Reser- [illegible] Corney Bayou. It will have several uses. One will be fishing, more will be for irrigation, and there will be a considerable amount of swimming and boating in this lake, but the two main purposes will be for recreation and for irrigation.

It would be to the interest of this lake to control the pollution coming into it. I would not hesitate--(this is beside the point, almost).---- I would not hesitate to swim in the lake, but I would not drink it with the pollution that would be coming into it at the present time.

I rather doubt that the amount of salt in the lake would be good for irrigation. If you remove the pollution from the stream that feeds Corney Lake, within two years that stream will be back to normalcy and produce the amount of

[illegible]

MR. STAFFORD: In addition to the effect of low pH on fish, as an expert I would like for you to speak to the point that has been discussed here, of the excessive growth --- bottom growth --- in Corney Lake, as a result of the clearing when those effluents from the oil field started coming into the lake.

WITNESS: I would like to preface that remark by making this general statement: That every nook and cranny on this earth's surface and in the water that covers the earth's surface is filled with all the life that it can support at that particular time under the conditions which happen to exist then. We have had described for us the conditions and color of the water which is necessary to build up the basic food material for the lower multicellular animals which serve as food

[illegible]

I should like to digress with you one moment and make some remarks on this score, if I may, and then continue on with respect to plants in the water.

We do not know exactly the number of pounds of plant material that is required to produce animal material, but it is estimated somewhere between fifteen probably and thirty pounds, in order to produce one pound of these small multicellular animals, which is the basic food material for the small fishes. Now, these smaller animals are in the form of insect larvae and nymphs, and in worms and in small crustaceans. It is estimated that from ten to fifteen pounds of this is required to make one pound of small fish. When we get the small fish -- we know this very accurately -- when we get the

[illegible]

[illegible] ., if you [illegible] the [illegible] lake, you cut off food supply, which, in turn, reduces the number of fish, and certainly the growth of fish, in these streams, although you may find fish present; and we do have some fish present today in Corney Creek and in Corney Lake, but they are usually very small, and will not grow. A fish doesn't starve to death; it stays there year after year approximately the same size, until it can get enough food material to grow. So, the pH, apparently, does not drop sufficiently low to kill all of these fish, but the ones which are in Corney Bayou, and in Corney Lake, are small and undersized, and unfit for sport fishing.

Now, I would like to go to the plants in the lake. It was stated [illegible] ---

[illegible]: Let me interrupt just a moment to say this: When you speak of Corney Creek and Corney Bayou, you are speaking of that section below the lake?

WITNESS: It would apply to small Corney Creek above. I use the words "creek" and "bayou" interchangeably. In South Louisiana, we call the streams "bayous". Generally speaking, in North Louisiana we speak of them as "creeks". So when I use the words "creek" and "bayou", I mean exactly the same thing.

Now, let's make this statement: It was stated this morning that about eighty percent of the lake is covered with water plants. I will confirm that statement, after careful studies, and only about twenty per cent of it is in the deeper water --- and, I will add, it has to be more than ten feet deep ---

[illegible] upon the

[illegible]

A few months ago I made this statement: That every environment, it matters not whether it is aquatic or on land, is supporting all of the life that it can support under the conditions of that particular time. That is true of Corney Lake. Now, when we have pollution coming down into the lake and destroying those small animals and microscopic forms, clearing up the lake, we open up a source of sunlight, which passes through the water and strikes these water plants, which are rooted at the bottom, and makes a perfect environment for those to grow, provided the condition of the water isn't such as to kill the plants, and apparently it isn't in this lake.

When this condition occurred, the plants spread from around the shallow edges, where they were before [illegible], they get into [illegible], and [illegible] the conditions [illegible]. I would say, then, that [illegible] body is supporting as much life, maybe more, in terms of tons, in the form of plant life, than it did in the terms of animal life before the pollution, but you can't catch plants and enjoy it in fishing.

MR. STAFFORD: Doctor, if the pollution coming into Corney Lake is terminated, have you an opinion as to the effect on that bottom plant life?

WITNESS: The plant life, which is mostly of the coon-tail group, or myriophyllum , will disappear in the deeper parts, but due to the fact that we have the plants rooting in the bottom, and coming all the way to the top, we will still have a problem of getting rid of that more luxuriant growth that comes to the top of the water. If we would come in and cut it down, [illegible] of the [illegible] sufficient to filter out the sunlight, then it would not come up from the bottom. In the shallower parts, I doubt we would get that amount of color. I think it will recur in the deeper parts, the normal color of the lake as it used to be before pollution, and if it got back to that color, and I have no doubt that it would reach that color again, those plants would disappear out of the deeper part.

Q Now, is that what you mean when you made the statement that you read that fishing would return?

A I had more reference to Corney Bayou, or Corney stream, in which we do not have the water plants. I am speaking now of the stream above the lake, and the stream below the lake, after it passes over the dam. I have no doubt at all that the stream would approximate the fishing condition within two years of what it used to be. Now, I

I make that statement based upon these facts: That when any body of water is stocked with fish -- and there are plenty there to stock it, of all the kinds of sport fishing that we have -- that is, the two kinds of bass, and the various species of bream -- sufficient to restock it -- at the end of a year, you approximately, if you have sufficient food material, the number of pounds that any body of water will support; so I put it two years in order to be safe within that statement.

MR. STAFFORD: "I believe that terminates our examination, Mr. Chairman.

CHAIRMAN: Any questions? I have a question I would like to ask the Doctor. Do any of the other members of the Board want to question him? --- Mr. Biglane would like to question him. Go ahead, Mr. Biglane.

EXAMINATION

BY MR. BIGLANE:

Doctor Fowler, as an ecologist, would you say that most of your work has been done in the aquatics, in the field of ecology?

A What little research I have done has been in the field of aquatic ecology, and dealt with some forty-odd different chemicals, as poisons of these smaller animals, I am talking about, principally of the crustacean group.

Q We discussed at length, or there was discussed at length, this matter of pH, and I would like for you to further clarify to the audience, and to the members of the Board, the range that pH as we know it goes from and to.

Q PH ranges, which, as was explained this morning --- from 7 down -- seven is neutral; neither acid nor alkaline -- has to do with the concentration of hydrogen ions in the water, and ranges from 7 down to zero. Now, when you go above 7, we run into alkalinity, and there the ions -- the [illegible] ions of OH -- the concentration [illegible] alkalinity; and that goes up to 14. That is the reason why we state that 7 is neutral, or normal. In other words, 7 is the pH of water -- distilled water -- that is neither alkaline nor acid.

Q Then a pH found in the lower ranges of a media could be called an acid media, is that right?

A That is definitely true.

Q Have you found any pH's in Corney Lake which would lend the name to the lake as an acid medium lake?

A I have not checked the pH of Corney Lake. I have gone upon the statements by the officials, in which they stated that the pH was low, but personally, I have not checked the pH of either Corney Lake or the stream below.

Q Well, going on the statement of officials that you state that you have heard would of hearsay evidence, and I had rather not [illegible] go on [illegible], if there are any which could be construed as leading the term "acid" to a media, and they did not affect fishes, could they then affect the fishes' food?

A Indeed they can. I tried to explain that a few moments ago, when I said that much of our difficulty at the present time is not because we have a pollution sufficiently strong to kill all the fish, but due to the fact that itis low enough to destroy this basic food material which fish must have in order to grow.

I would like to make this statement to clarify that, and divide it into three phases: when you drop below 4.5 to 4, most of the fish are killed. Now, there are some of the minnows which can live in pH below that, but I am speaking in terms of our game fishes. And when I use the term "game fishes" here, I mean the various species of bream, of which we have [illegible], and the three species of [illegible]; and also of what we call the crappie, or white perch. We have two species of [illegible].

The second phase would be where spawning is stopped, which runs from about 6 down to 5. Now, we have fish which will live betwen 6 and down to 5, where the fish will live between there and 4.5 and 4, but those fish will not have the food material in the water in order to build up through these successive stages which I have mentioned, and, therefore, their growth is reduced, or ceases entirely, and the fishing, of course, is ruined.

Q In other words, in summing up that portion, lower pHs can inhibit the growth of fishes' food; in other words, they might not be as tolerant to that media as the fish?

A That is correct.

Q And it may affect the fishes spawning activity?

A. That is correct. One of the first evidences of pollution --- a person who has training in it can take a glance at the water in this region, and [illegible] tell the amount of pollution by the color of it. And this small form of plant and animal life is the first to disappear when it clears up. Now, that occurs from pollution; it also occurs in the wintertime, with the drop of temperature. Along this time of the year, our streams that are normally greenish or tannish in color, will clear up with the lowering of the temperature, which stops the growth of these small forms of life that I have described. But in the summertime, when it clears up, in streams of this region, you can be quite sure something is coming into the water that has stopped the growth of these forms of life, and, I said a moment ago that wherever you have a nook or cranny, in this region, it is filled with that kind [illegible] cleared up, you can be [illegible] in quality into it [illegible] along the growth of it.

Q You mentioned a figure a while ago of five hundred parts per million, or five hundred parts per thousand, or five-tenths of a per cent of chloride, as sodium chloride, being the limit for spawning of fish?

A That is correct.

Q Do you know ---

A That is of game fish.

Q Of game fish.

A Now, of course, you got into the salt fishes; they live in a much more concentrated environment, and that is their normal environment.

Q We are speaking of fresh water fishes here; those contained in the Corney Drainage Basin particularly. Do you know if that concentration of salt has ever been attained in either Corney Lake or any of its

[illegible]

A I have not measured it.

Q Have you ever taken a plankton count?

A No, I have not taken a scientific measured plankton count. Judged only from the appearance of the water am I speaking, which is accurate enough, by the way, to determine pollution; but the extent of the pollution I would not be able --- that is, the figures, in pollution -- I would not be able to give.

Q You stated that an environment will hold or support as much as it can as it is.

A That is correct.

Q Then, if we want more fish in that lake --- and that is assuming that we do want more -- we couldn't get it by restocking it, in its present condition?

A No, you cannot. We have plenty in there to restock. We have to produce an environmental condition so these microscopic, and super, just above microscopic forms can grow. We have enough of that in there to restock, too.

All we have to do is to reproduce an environment in which they can grow, and immediately we will have this bloom we are talking about that gives color to the water, which starts off the succession of stages, and there are many stages between these microscopic forms and the fish that we catch.

Q Do you know what the average, or general average, or a good figure which should be substantiated, of the number of pounds of any types of fish per acre found in Louisiana waters?

A I can speak of terms of the number which you would expect to find in ponds where they are properly fertilized to grow this tremendous amount. I do not have any accurate measurements of the poundage of fish in Louisiana. Generally speaking, you could expect in a pond that is properly fertilized, where you do have the color that you normally see in the streams in the community, it will support between [illegible] pounds of fish per acre, up to as high as 500 pounds. Now, I can speak with accuracy of some similar streams in Alabama, where we actually checked the poundage of fish per acre in streams similar to the ones we are talking about here. There we were able to poison and take per acre in one stream, the Black Warrior stream, not too far from Montgomery, Alabama, 312 pounds of fish per acre; and of the Big Tombigbee River, which is a somewhat larger stream than Corney, but about the size -- not quite as big -- as the Ouachita River into which it flows --- We actually collected 512 pounds of fish by taking the acre with Rotenone poison. I would assume, since we are in the same latitude, and similar streams, that we might expect about that amount of fish from our streams here. And I would say that Corney Creek, and other [illegible] streams --- that one that I could go [illegible] miles to Corney was the [illegible], and [illegible] some twenty miles -- I found enough to [illegible] more poundage than that per acre, when they were normal.

Q In your opinion, does Corney Lake, or any of its tributaries, contain 300 pounds of fish per acre?

A I couldn't say. I don't know of any occasion where it has been measured. It will be very easy to measure it, however. And since this has come up, I have a lingering suspicion I shall before too long. (Laughter)

Q In summation, then, Doctor, you state that your objections to the water quality of this lake are two-fold. First, that you have been led to believe there is a low pH or acid condition existing in the lake?

A That is correct.

Q And secondly, that there may be an excess of salt or sodium chloride in the lake?

A That is correct.

Q And that there was [illegible] since the lower-[illegible] the alkalinity of the water, and the [illegible] of growth of the [illegible]

A That is correct.

MR. [illegible]: Thank you very much.

CHAIRMAN: Is there any other cross-examination?

CROSS-EXAMINATION

BY MR. KEITH:

Q May I ask one or two questions, please, sir: Does the introduction of sodium chloride into water cause an acid condition, Doctor?

A I can't answer that question for you. I know of no way in which it could, unless the chemical reaction united with other chemical substance in there in order to release the hydrogen ions. Since sodium is NaCL, there would be no hydrogen ions in that. But you could have a reaction there with some other chemicals in the water, and probably not the hydrogen ions.

Q Then the introduction of sodium chloride into Corney Lake and its tributaries might or might not have the effect of creating this acid condition of which you speak?

A I would have to say yes, because I am not sure of that statement.

Q Doctor, do you have any non-contaminated streams and lakes in Louisiana in which you have a rather profuse growth of water lilies, or water hyacinths, as we usually refer to them?

A The larger lake, which we call the Black Lake, which runs ninety thousand acres in size, once upon a time we had a profuse growth of the water hyacinths over a good part of the lake. We came in and poisoned that out, and when that was done, since this lake is very large, and much of it was shallow, we did have water growth coming up from it. When this was killed had settled to the bottom, it produced a [illegible] amount of [illegible] material as fertilizer; and we had a growth in there of several kinds of water plants; among them would be the same kind, we find in Corney Lake, and some others, also.

Q Are you familiar with the lakes around Marksville, Louisiana?

A Only as passing through; I have never fished them.

Q Then you have no knowledge concerning the water growth in those lakes?

A I do know that in many of those, until they poisoned them out, the water hyacinth was on top. I do know, in those lakes --- well, I will state from a general ecological standpoint -- in the shallower parts, you always find water plants, duckweed floating on top, and emergents of the kind we find in Corney Lake here; we had them around Corney Lake before it be-

been polluted and cleared up, around the shallow parts, but not out in the deeper part.

Well, then the growth of these water plants of which you speak, it is not solely due to the introduction of sodium chloride or salt water into the lake or stream?

No, it is the quantity of it, and the continuous growth out into the deeper water, and the filling of the lake after it clears; the water clears that makes the objectionable phase of it.

MR. KEITH: That is all.

CHAIRMAN: Any other questions?

EXAMINATION

BY THE CHAIRMAN:

Q. I have just a question or two, Doctor. I want to get clear on the point whether it is the presence in the water of salt in solution, or something else, that affects the pH characteristic of the water, which has this des-

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[illegible] effect on the small organism. Now is [illegible] I did understand you to say, in answer to Mr. Smith's question, that the presence of salt in solution alone would not necessarily affect the pH?

A No, I said I did not know.

Q Well, do you know what it is that does affect the degree of pH in this water?

A It would have to be either acid coming into it or chemical reactions that produce the hydrogen ions, whenever you find a pH dropping.

Q Well, as you mentioned a while ago, "ordinary salt or sodium chloride does not contain hydrogen ions?

A Well, that is the chemical constitution of it contains sodium and chlorine. Therefore, the breaking down of that compound into its two elements would not in itself change the pH, but chemical reaction to these two with other forms might release the hydrogen ions. We must have the hydrogen ions in order to from the oilfield, with the corresponding change in pH.

Well, what do you know yourself from your own observation as to what the situation of that water was with regard to its pH before the salt water, or water containing other contaminating material, began to come downstream, when it was in its natural condition?

A I would not have accurate data on that. I would have to speak from the standpoint of my knowledge of ecology and where we find this kind of plant life. I would say that you would have to have somewhere between 6, and probably 8 or 9, in order to get this growth we are talking about. That is, those ranges of pH are normally what you find where you find a tremendous amount of what we call this "water bloom" or the microscopic forms, and so forth.

Q But you did, during the years since your early days that you have been fishing and [illegible] that it did have that type of growth in it?

A Unquestionably. I have fished those streams that we have under consideration, and the lake, about as heavily as anybody in this region, and, due to the fact that I have had training in that field, one gets much of his pleasure in outdoors recreation in observing and appreciating the things he can see beyond the point of just catching fish. So I can assure you that the color of the water in Corney Bayou, and in Corney Lake, too, was transformed from the color which carries the type of microscopic, and above, forms of life, into the clear water, which does not have, as pollution came into it, or whatever it was that caused it. I am not saying what came into the lake and caused it; I am merely talking about the ecology of the stream and the water in the lake.

Q Now, if I understand you correctly, you have been attributing the harmful effect of the presence of silt or other foreign material in the [illegible] or the destruction of the beds [illegible], rather than to the actual killing of fish?

A Well, I understand there have been fish-kills; I have not seen them in Corney Creek, but I have seen them in other streams up here by the hundreds of pounds.

Q Well, that was what I was going to lead up to. I wanted to ask you if you had actually observed any direct fish-kills in these waters that we are talking about?

A Not Corney Creek, or Corney Lake. But I have heard others say that they had seen them in large quantities, as many as three different kills per season. I have seen as many as two in some of the streams east, some twenty miles east of Corney Creek, which I fish; used to fish as often as I did Corney Creek.

Q Well, did that have any connection with the run-off from those oil fields that we [illegible] in this case?

A They [illegible] general area, but I [illegible] with respect to Corney Creek. I will say this, and go on record as saying it, that SOMETHING HAPPENED to the water that came into Corney Lake and Corney Bayou below the lake that transformed it from an environment where these various forms of life, which are basic food material for fish -- transformed it from an environment where they could grow to an environment where they do not grow.

Q Were you here earlier in the hearing and heard the testimony of other witnesses who have described fish-kills in these waters that we are talking about?

A I came in at eleven o'clock this morning.

Q Well, then, you probably did not hear their testimony about the direct fish-kills.

A No, I did not.

Q But, in your opinion, if there were direct fish-kills, would that be attributable to the disappearance of this small organic life, as the sole or any direct cause?

The kill would be directly from the pollution in the stream itself. It might be from the acidity of the water, or numerous other kinds of poisons. One of the quickest kills of all, I mentioned a moment ago, is Rotenone or Zero powder. That doesn't change the pH at all; it causes a constriction of the capillaries in the gills of the fish which smothers them to death, because they cannot carry on respiration. So there are other poisons, or pollutions, if I use the general term, that will cause the kill of fish, but acidity will, also. I cannot say specifically what caused the kills.

Q But you don't expect a direct fish-kill from the disappearance of these small organisms that you have described?

A I would like to state it this way: There are differences in concentrations which will cause the kill of these smaller forms of life before it is concentrated enough to kill the fish. If it goes on down and becomes bad enough, it will kill the fish itself. But it is possible to have fish in the stream -- without food material, and not growing -- have fish in the stream which are growing somewhat, but not with enough food material to spawn. And then, of course, we have the fish with sufficient food material in order to produce the spawning. It takes, for bream, some three months of good feeding before they have enough food material to produce eggs; it takes six months for bass.

So we have these various matters hindering production of fish. All the way from a kill to the lack of spawning, to being able to live without growing, and then living with proper growth, if they have the food material.

CHAIRMAN: Any other questions?

[illegible]

BY MR. POOLE:

Q Doctor [illegible], I believe you stated that you have fished Cooney Creek rather intensively since 1933?

A That is correct.

Q And you have also testified as to this change in environment. Can you tell us about when this change in environment took place?

A Well, the worst of it came on since 1950. I would not want to say the specific year. There was a fading out, I would say, since the late forties, and especially since 1950. It was testified earlier --- I was back in the audience --- that it occurred in 1953. I would not want to contradict that at all. That would be what I would agree with entirely.

MR. POOLE: Thank you.

CHAIRMAN: Any other questions? That is all, Doctor.

CHAIRMAN: Do you have any other witnesses you want to call out of order?

MR. STEIN: No, sir.

CHAIRMAN: Well, then, I suppose you want to recall Mr.Anderson?

MR. EDELMAN: That is correct.

CHAIRMAN: His testimony has not been completed.

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JOSEPH B. ANDERSON

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recalled as a witness by counsel for the Government, having been previously sworn, was further examined and testified as follows:

DIRECT EXAMINATION CONTINUED

BY MR. EDELMAN:

Q Mr. Anderson, as I recall your testimony before the break for lunch, you had completed a description of your inspection of the wells in the Village Field and the one in Spotsville and the one in Atlanta.

A Yes.

Q From your observations, are you able to say whether or not the seepage and discharges that you described, and which you observed on those inspections, reached tributaries of the Corney Drainage System?

A Yes, I observed these seepages from the pits flowing directly to the various tributaries of the Drainage System.

Q Have you made chemical analyses of the waters in this area that were not affected by drainage from the oil fields?

A Yes, I have examined by chemical analyses the upper tributaries of the Corney System.

Q Can you tell us what those analyses show?

A These analyses show very low chloride concentrations; ten to twenty parts per million of chloride. They show a pH varying from about 6.5 to 7.

Q You have heard the testimony of Dr. Fowler.

Q Do you agree that the conditions you describe are favorable for fish life?

A In the upper portions?

Q Yes, sir.

A Yes.

Q What streams were those, can you tell us directly?

A Fish life has been observed in Corney Creek above the Village Field. It has also been observed in Harper Creek above Village Field. Samples of fish were collected from these points. The sampling was done by the Arkansas Game and Fish personnel. I accompanied these people, and a good variety of fish were obtained from those sampling points. These fish included bass, several species of bream, suckers, small catfish, and others.

Q When was that fish count taken with respect to those streams; would you state that? What year?

A This was in June of 1954.

Q Do you consider that the number of fish you know in these streams that are not affected by dumps from the oil fields to be normal for that area?

A I consider them normal for that particular section of the stream.

Q Now, did you make chemical analyses, or did you have them made, of the waters of Corney Creek below Village Field, and of Three Creeks, below the Schuler Field?

A Yes, a number of analyses have been taken from various points.

Q I call your attention specifically to the records of the United States Geological Survey, and ask you on the analyses that you made or the analyses which were submitted by the Geological Survey, what these analyses show with respect to the conditions of those streams?

A The U. S. G. S. analyses, which I believe are included as Government Exhibit No. 47, show chloride concentrations and pH for the [illegible] Three Creeks. These analyses have been taken from 1950, and at that time, there was considerable chloride passing down the streams at these sampling points. A change was noted in Three Creeks in the year of 1954, and since that time, concrentrations have generally been considerably below the earlier analyses. Corney Creek has varied from time to time, depending upon flow, but frequent high concentrations of chloride have been observed in Corney Creek.

Q When you say "high concentrations of chloride", can you give us an estimate of the parts per million that your reports showed?

A Chloride concentrations will vary from the two hundreds, perhaps, during high flow, to nearly ten thousand parts per million when there is zero flow.

Q Can you tell us what the pH values were

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in Corney Creek?

A The pH values in Corney Creek have been below 4. I think 3.7 has been recorded many times. When there is more water, of course the pH rises somewhat, but I don't recall of there being any record of a pH of 7 or above.

Q Do you have any explanation of the high chloride count and the low pH value on Corney Creek?

A The pH value in Corney Creek, I believe comes from the discharge of oil field brines. There have been a number of observations and measurements of pH of the oil field brines themselves. It has been observed that these brines may be in the range of 5 to 6 1/2 when collected. On numerous occasions, these pH's have lowered upon standing. A few samples have been collected in the fields, such as seepages, which have been below 4, and in the streams, the pH's have been 4 or even below.

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Q Now, with respect to your testimony on [illegible], you indicated that the chloride content of Three Creeks declined sharply in [illegible]. Earlier there was testimony that there had been a clean up in Schuler Field. Was it about the time of the clean up that the chloride count dropped?

A Yes, the measurements that I have been referring to were following the period when the clean up was observed in Schuler Field.

Q Would you consider the present condition of the waters of Three Creeks that you have testified to as favorable or unfavorable to fish life?

A I have observed Three Creeks at a number of locations. A short distance above the highway, the Arkansas Game and Fish Commission killed fish in a pooled area of that stream, and recovered a number of fish, including such things as bream. I [illegible] fish in Three Creeks to the Arkansas Highway 15 bridge, and have [illegible] fish [illegible] in Louisiana.

Q Can you [illegible] compare the conditions in Corney Creek with respect to fish life with those of Three Creeks at this time?

A Below Village Field, I have never been able to find any fish. The Arkansas Game and Fish Commission attempted to recover fish from the stream by means of Rotenoneing. Heavy dosages of Rotenone failed to yield any fish in Corney Creek below Village Field to a point just above Arkansas Highway 15.

Q From that attempt, you would conclude that there were no fish in Corney Creek?

A I would conclude that there were no fish in Corney Creek below the oil fields.

Q And that fish count was made in 1954?

A 1954.

Q Did you make a study of biological life in Corney Creek?

A Yes. I [illegible] a [illegible] of samples along Corney Creek, both above and below pollution.

Q I call your attention to the report which has been exhibited earlier, entitled "Biological Studies in the Corney Drainage Area", dated March, 1950, Government Exhibit No. 57, and ask you whether that is a report of the biological study you made?

A Yes, it is.

Q Can you tell us more about what this study showed?

A This stydy was for the purpose of determining what kinds of bottom life, other than fish, existed in Corney Creek.

The study also included chemical analyses that were taken at the same time bottom samples were collected. Samples above pollution indicated that there were types of organisms which would reasonably be expected to be found in that type of stream bottom. In the areas of pollution, the number of organisms was reduced greatly, and in [illegible] no organisms were found. This area extended into Louisiana from four to five miles above the lake. There was a very poor bottom fauna in that entire reach of Corney Creek. The pH and chloride analyses taken at various points on this stream indicated that the water would not be suitable for fish; in fact, fish would be expected to be killed in a very short period of time if they were placed in that water.

Q Did you actually make any such tests, such as placing fish in waters taken from Corney Creek?

A In the latter part of 1954, some tests were conducted in which waters were collected from Corney Creek and tested to see whether or not fish could live in them. The fish were collected from Corney Lake, where they do live. Corney Lake water was used for dilution purposes, and either the Corney [illegible] water or other samples were used for test purposes. Brine collected in Louisiana above the lake, from Corney Creek, killed fish in a matter of a few minutes. This was true also with samples collected in Arkansas at Highway 15 bridge, and from samples collected near Spotsville Samples of the oil field brine were also collected, and, even though dilutions were made, fish could easily be killed in these brines.

Q In other words, the waters of Corney Creek as polluted by the oil field discharges are deadly to fish?

A They are very deadly to fish.

Q I call your attention to Pages 10 and 11 of the report that has just been referred to, and I read to you the statement in there: (Reading) " Although pollution is easily detected in Corney Lake, the concentration of pollution does not reach the high levels that occur in Corney Creek.

Consequently, fish and other aquatic life [illegible] were killed occasionally in the inlet area of the lake, presumably from the higher concentrations of pollution from Corney Creek." I now ask you whether you personally observed any such fish-kills in the inlet area of Corney Lake?

A Yes, on two occasions I observed fish-kills; one was in December of 1952, and another time in February of 1954.

Q Can you describe those fish-kills to us?

A On both occasions, there were many thousands of fish that had been killed in the headwater area. This is at the Highway 115 bridge. These fish were of various sizes. I noted particularly bass and bream, some pickerel, and a few catfish that had been killed. I was impressed by the number of fish that had been killed. It appeared to be a rather thorough kill, and the material appeared to be of a very toxic nature, because they were distributed over a wide area.

Q Do [illegible] as to the cause of these fish-kills?

A I believe the fish-kills were due to the pollution which came down Corney Creek.

Q Mr. Anderson, did you make any chemical analyses or tests of the waters in Corney Lake, and below Corney Lake?

A Yes, I have made analyses of the stream, the lake. In Corney Lake, chloride concentrations have been observed to be a thousand, or in the headwater area, above three thousand, parts per million. The pH values in this lake are low. PH values 4 to 4 1/2 have been observed at certain times. Below the lake, pH values in the order of 5 to 6 have been observed.

Q Would you consider the lake as a favorable or unfavorable environment for the growth of fish in the light of the chloride content and pH values of the water?

A I believe the pH values in Corney Lake are so low that it is an unfavorable environupon the fish.

Dr. [illegible], you heard Mr. [illegible]'s testimony as to the amount of chlorides that were deposited in Corney Creek, and your own analyses indicate that there is a high level of chlorides in the waters of Corney Creek. Would you expect to find harmful effects of those chlorides in waters below Corney Lake?

A Yes, I think the chloride concentrations, such as occur in Corney Lake, and even below Corney Lake, are not favorable to the best production of bottom life and plankton and fish life.

Q Did you hear the testimony of preceding witnesses as to the clearing of the water and the diminution of the number of fish present in waters below Corney Lake at Bayou D'Arbonne?

A Yes.

Q In your opinion, are those conditions attributable to the pollution which enters the Corney Drainage System in Arkansas?

A I believe they are definitely associated with the pollution.

Do you know of any sources of pollution which would produce the chloride and pH values which you have described other than brine from the oil fields in this area?

A I do not.

Q May I ask you this: If the waters of Corney Creek were returned to their natural state, such as you have described them above Village oil field, in your opinion would the conditions in Corney Creek and Corney Lake and below Corney Lake be favorable to the growth of fish?

A If the pollution were discontinued, I think the lake and the streams would return to a normal condition in time. Exactly how much time that would require, I do not know. Of course, there are a number of favors that are involved. If the pollution were stopped immediately, it would improve the situation; however, there are considerable salt deposits which would have to be leeched out of the soilts, and this may continue for an indefi-

[illegible] portion of [illegible]

Q You indicated earlier that Three Creeks is now in a condition where it is more favorable to fish life than previously in that the chloride count had been reduced. Did you indicate whether the reduction of chloride count was due to the clean up in Schuler Field?

A I believe the reduction of chloride content is due to the clean up, principally in Schuler Field.

Q And presumably if the same clean up occurred in Village Field, would the chloride count in Corney Creek also decline?

A That is right; it would.

DIRECT EXAMINATION

CONTINUED BY MR. STEIN:

Q Did you in times past examine Three Creeks as compared to Corney Creek before the clean up in Schuler Field?

A I have not examined Three Creeks as completely.

Q Will you refer to the records of the chloride and pH in Corney Creek as compared to the flow in Three Creeks [illegible] the clean up in Schuler Field? That is, you might refer to this Government Exhibit there. (Indicating)

A Are you referring now to the United States Public Health Service records in which you would like to compare the chloride concentrations in Three Creeks to Corney Creek?

Q Yes; before 1954.

A I can look those up. (Witness examines records) In 1952, August, Corney Creek had pH values which were almost consistently 3.7, 3.8, with one value as high as 4.3. Chloride concentrations ranged from about thirteen hundred, and were consistently, except for about eight days, above four thousand; nearly reaching five thousand. The chloride concentrations of Three Creeks ranged from 410 parts and it was more erratic. However, the major portion of the time, it was below four thousand; a maximum concentration of six thousand parts. The pH in

Three Creeks, however, varied between 7.6 and 8.5.

Q Would you say at that time as to the chloride count, from the records that you have given, that they were roughly comparable; that about the same amount of chlorides, roughly, were coming down from Three Creeks and Corney Creek before the clean up in Schuler Field?

A Without discharge records, it is a little difficult to estimate the amount of chloride. However, the concentrations are such that there was considerable concentration, and therefore there was, with reasonable flow here, roughly the same concentration. The concentrations were comparable.

Q But now, the records show that the concentration of chlorides in Three Creeks subsequent to the clean up of Schuler Field is much lower?

A Yes, the chloride concentrations are considerably lower in Three Creeks.

Q As compared to Corney Creek?

A As compared to Gurney Creek.

MR. [illegible]: Thank you.

REDIRECT EXAMINATION

CONDUCTED BY MR. EDELMAN:

Q Mr. Anderson, would you consider that Three Creeks as it existed in the period for which you gave those high chloride readings was favorable or unfavorable to fish life?

A The concentrations were unfavorable to fish life. This was for the year 1952, before the clean up.

MR. EDELMAN: We have no further questions.

CHAIRMAN: Mr. Keith, have you any questions?

CROSS-EXAMINATION

BY MR. KEITH:

Q Mr. Anderson, would you please describe to the Commission the size of the streams in and above the Village Field, and whether or not they are intermittent streams?

A The streams above Village Field are small [illegible]. It is in the headwater area. I have observed Carsey Creek flowing at each time I have been there, and also Harper Creek.

Q By "small", could you elaborate on that? Are they three feet wide, or five feet?

A The streams are approximately eight to twelve feet wide. Depths will vary from a couple of feet down to a matter of a couple of inches.

Q And it has been your observation that these streams flow at all times?

A On each occasion that I have been there, I have seen them flowing.

MR. KEITH: That is all.

CHAIRMAN: Any members of the Board any questions? Mr. Biglane.

EXAMINATION BY MR. BIGLANE:

Q Mr. Anderson, as you carried out these biological surveys, was there any other group that assisted you in the field work, besides the Federal Agency?

A There was considerable cooperation in these studies that I have been referring to. The cooperation in conjunction with the Arkansas Game and Fish Commission; the Louisiana Stream Control Commission personnel also participated in a number of these studies.

Q Insofar as methods go, was there agreement that you were using the best method of analyses at all times?

A I think there was.

Q Getting back up to the Village oil field, and the pits therein, are there any fire walls surrounding the tank batteries; that is, those receptacles that hold oil; are there fire walls around those?

A There are fire walls around them in most cases. However, they have breaks in the banks, and drainage can usually flow from the tank batteries to the surface.

Q Would there ever be any occasion for an operator or an owner of such batteries to release any material from these receptacles?

A Yes, there has been evidence on a number of occasions that oil, salt water and salts have been discharged from these tank batteries.

Q In your opinion, these pits that were dug, would they hold all of the brine that is being produced, taking into account the evaporation factor, and that they did not seep?

A No. When the rate of production is considerable, these pits will not hold for a very long period of time. I think I made calculations on a pit, which indicated that in two months the pit would fill up.

Q Then what would it do?

A It would overflow, or, of course, be drained prior to that time.

Q Would there be any material excepting brine in these pits?

A There is a floatage on the surface of paraffin-like substances and oil.

Q Are these pits so constructed that they are not in any danger of being washed out? In other words, could a breakage occur? Have you ever observed a breakage, or is there erosion from rain?

A I think both of those conditions occur. I have observed breaks in these pits, and I have observed considerable erosion from the rain.

Q Then, am I to understand that if a pit should break, it would turn loose vast quantities of this material and thus send it down the stream in what we might call "a slug" ?

A Yes, it could.

Q Would this be more damaging than a spasmodic dribble of brine, so to speak, of a constant flow; would a slug be more dangerous than a constant flow?

A A slug would be much more dangerous.

Q You stated that these brines tended to become acidic upon standing?

A Yes.

Q Is there any occasion for these brines to stand in a creek or in a tributary to Corney Lake so that they might become more acidic?

A Yes. Of course, these brines stand in the pits, then they may become more acidic, and, also, when there is a period of drouth, Corney Creek will actually stop flowing, and there will be large pools of water in which the waters will stand.

Q Then these brines are afforded two opportunities to stand and thus become more acidic?

A Yes, they are.

Q Does the clarity of water significantly, in your opinion, have anything to do with the growth of hyacinths; water hyacinths?

A I have never observed water hyacinths in Corney Lake, or in the Drainage System.

Q Have you ever observed water hyacinths growing on any body of water?

A Yes; in South Louisiana I have observed them.

Q Then I ask again, in your opinion, does the clarity of the water either enhance or retard the growth of water hyacinths?

A I don't believe it would have much effect on the growth of water hyacinths.

Q I ask the same question of water lilies; the broad leaf water lily?

A The water lily roots in the soil, and of course the leaves come to the surface, and so I don't think the clarity of the water would have any effect on the water lily.

Q How about myriophyllum?

A I think the clarity of water would have a great deal of effect on myriophyllum.

Q Do we find myriophyllum in Corney Lake?

A Yes.

Q What is the most obnoxious aquatic plant in Corney Lake?

A I think myriophyllum is.

Q Is it usual in running a biological survey to go to a point most up-stream from pollution to determine more or less a control station of what that stream might be if it were not polluted?

A I think that is done almost always.

Q Does the size of that stream make any dif-

[illegible]?

A The size of the stream makes a difference in that the conditions should be noted to determine that particular environment.

Q But if the water contained in that area, the size of the stream, would it make any difference on the quality of water above pollution?

A Nothing on the quality of water.

MR. BIGLANE: I think that those are all the questions I have, Mr. Chairman.

CHAIRMAN: Any other questions? I would like to ask Mr. Anderson a question or two if no one else has any questions.

EXAMINATION BY CHAIRMAN

Q Going back to these pits that you described that were constructed by some of the operators to hold the brine after the oil is separated, is it possible to construct a pit of that nature of such material and construction and size that it will hold the production from such a well?

A The actual construction of the pits perhaps is feasible, provided proper materials are used.

Q How would it have to be built?

A Some impervious material, such as asphalt or concrete, would probably have to be used to make it entirely impervious.

Q In other words, it would have to be built of solid material so as to be improvious to seepage; is that it?

A I believe that would be right.

Q And large enough so that it would contain the production without danger of overflow?

A That is right.

Q Well, then, what would happen --- Would it be the purpose to have that pit large enough so that ultimately the evaporation would equal the discharge into the pit?

A The salts that are in the brine would remain in the pit. The only thing that could be lost by evaporation would be pure water, the quality of distilled water, and the salts would remain in that pit.

Q Is that practice followed in any oil field operations?

A The pits are used. However, I don't believe that any salts are destroyed or gotten rid of by pits.

Q Well, are there any operations where the pits are large enough so that the evaporation gets rid of the water, leaving the salt in the pits, so that it does not get into the run-off, down the watershed?

A I have not observed any pits that completely kept salt water from going into the surface and into the streams.

Q Well, if a pit were so operated as to contain the discharge of brine from a well and to accumulate a quantity of salt through evaporation, what would be the ultimate disposal of that salt?

A The salt would remain in that pit until it was hauled away by some other means, if evaporation reduced it to a solid material.

Q Then, it would have to be hauled away and disposed of?

A Yes, the solid would remain in the pit, until --

Q Otherwise, could there be danger that it might escape through a flood or a breakage of the dyke, or something of that nature?

A That is right, there would.

Q Now, you speak of these structures as "pits". Are they dug in the natural ground, or constructed by dykes?

A There is, of course, a wide variety of pits, but commonly the usual practice is to use a bulldozer and dig into the ground on a slope. The dirt that is removed, then, is placed into an embankment, so that usually one side of the pit forms part of the natural ground slope. At least one side of the pit, then, is simply an embankment on the surface of the ground.

Q Well, then, as to any of these pits that you observed in this oil field that is under consideration here, were there any of them of such construction as to be safe against possible future breakage of the walls and washing out of the salt accumulations in case of heavy rains?

A None of these eighteen that have been shown on the map have pits which will contain the brines.

Q There would always be that danger, then ---

A There would always be seepage.

Q --- of the washing of the salt residue into the run-off?

A That is right.

Q And there would be no place for it to go except down Corney Creek?

A That is right.

CHAIRMAN: That is all. Are there any further questions?

RE-DIRECT EXAMINATION

BY MR. EDELMAN:

Q Mr. Anderson, you testified earlier that on the pits you inspected you found a formation of oil and paraffin scum on top of the liquid in the pit; is that correct?

A Yes.

Q Would the presence of that scum tend to retard evaporation?

A Yes, it would.

Q May I ask you, based on your knowledge of the production of brine of wells in the fields we are discussing, do you have any idea how large a pit would be necessary, assuming it were made with an impervious lining --- how large a pit would be necessary to contain the brine production, without overflow?

A The pit, I am sure, would have to be of a size beyond any reasonable size. It would take an extremely large pit to hold the brine that is produced daily from many of these leases.

Q Now, I am not sure I am using the correct term -- In a pit that large, would there be a tendency of the water to exert pressure on the lining of the pit?

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A Yes.

Q Would that tend to cause the lining to crack and break?

A I understand that where asphalt and other materials are used that that is a problem.

CHAIRMAN: Are there any other questions? That is all, Mr. Anderson.

(Witness excused)

CHAIRMAN: Now, it is five o'clock, and I wonder what the pleasure of counsel is as to continuing further now, or having an evening session?

MR. STEIN: Sir, we have one more point to get in now on a stipulation, and then we would be subject to the wishes of the Board, and could either continue now, or have an evening session, at the pleasure of the Board and the other counsel and the members here to testify.

CHAIRMAN: Can counsel for the Government, or for the other parties, give us some idea now of how much further time will be required, either for presentation of evidence, or for closing arguments?

MR. STAFFORD: Mr. Chairman, we have witnesses who have come substantial distances. Some cannot come back for a night session, and can come tomorrow, and we have one or two who can stay for a night session, but can not come back tomorrow. We have others who have to leave now, and can come back tomorrow. I am in a dilemma. I particularly would like to get a few brief factual statements from Mr. Felder, who operated a concession out there for many years, and one or two others, now if I could, because I understand that we might not have him available either tonight or tomorrow.

CHAIRMAN: Well, do I understand that you have some witnesses that you would like to put on now in order to be sure of getting their testimony?

MR. STAFFORD: Yes.

CHAIRMAN: And could you dispose of them within the next half hour?

MR. [illegible]: Yes, sir. I can confine the questions to the particular facts that I want, and in the absence of a lengthy cross-examination we can get rid of them quickly, Mr. Chairman.

CHAIRMAN: Well, then, if it is agreeable to the other members of the Board, we will continue and hear the testimony of those witnesses.

(Conference among Board members)

[illegible]

WE HEREBY CERTIFY that the foregoing pages constitute Volume I and are a true and correct transcript of our tape recording of the proceedings at a public hearing before the Board appointed by the Surgeon General, United States Public Health Service, Department of Health, Education, and Welfare, to hear the matter of the Pollution of the Interstate Waters of the Corney Drainage System (Arkansas-Louisiana), at Homer, Louisiana, beginning at ten o'clock A. M. on January 16, 1957, until five o'clock P. M., Volume II containing the remainder of said transcript.

DATED at Shreveport, Louisiana, this the 15th day of February, A. D. 1957.

Hazel Autrey
AUTREY REPORTING SERVICE